Jobs requiring creativity and innovation

Jobs that make a difference in the world

MAKE YOUR FUTURE:

United States Manufacturing Industry

A practical guide for educators

Family-friendly jobs with competitive salaries and great benefits

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.[9]

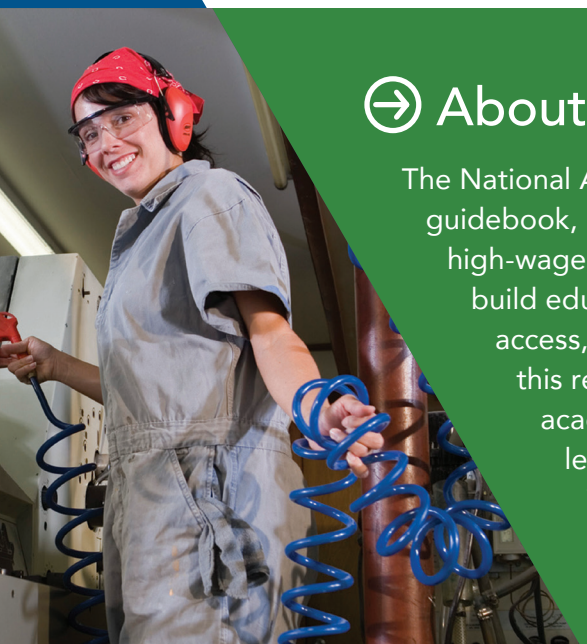
Make Their Futures!

You play a big role in shaping your students' pathways into the workforce. Understanding the United States' key industries can help you provide sound advice and connect students to resources to help them ***make their futures.***

This guidebook is designed to provide relevant information about the United States' manufacturing opportunities and the pathways that students can take to high-paying, satisfying, and rewarding careers in the manufacturing industry. Many groups, especially females, students of color, students with disabilities, English language learners, and students from low socioeconomic backgrounds are significantly underrepresented in high-skill, high-wage jobs in manufacturing.

These inequities exist in part due to our stereotypical way of thinking about careers. For example, nurses and elementary school teachers are often portrayed as females, mechanics as males, engineers or leaders in manufacturing fields as white males. These stereotypes create hidden obstacles, but you can help break down barriers that limit females and other historically under-represented student groups from pursuing these fields by using equitable instructional strategies, such as the ones included in this guidebook. These strategies have been proven to increase motivation, engagement and success in students, and can create powerful changes in behaviors of students who are often underrepresented in certain fields or roles. As you read through the lesson plans in this guidebook, you will notice this symbol ☑ that correlates to the strategies. Consider implementing them in other lessons to increase equity in your classroom.

> "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 Manufacturing**[11]



About NAPE.

The National Alliance for Partnerships in Equity (NAPE), which produced this guidebook, is dedicated to ensuring that every student has full access to high-skill, high-wage, and high-demand career pathways and jobs. Our sole mission is to build educators' capacity to implement effective solutions to increase student access, educational equity, and workforce diversity. We hope that you will find this resource to be helpful and informative as you work with students to apply academic skills to specific jobs and careers. This will also help students learn more about their future career options in manufacturing. **For more information about NAPE, visit www.napequity.org.**

12.3 million people work in manufacturing jobs[9]

10% of manufacturing workers are black or African American[1]

16.6% of manufacturing workers are Hispanic or Latino[1]

29% of manufacturing workers are women[1]

Dream It!

Manufacturing careers include creativity, caring, and collaboration, three Cs that have been connected to motivation and engagement for many students, especially women and students of color.[9] What kinds of students would like a career 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

Manufacturing is an exciting, creative and high-tech field. Advanced manufacturing technologies will help the United States lead the world in innovation, job growth, and a healthy economy. Every day manufacturers are using new processes and materials to make products safer, less expensive, and easier to use, which is better for all consumers. We can also now manufacture products on-demand to reduce waste, which is better for the environment. Members on a manufacturing team are creative and collaborate to make safe products that simplify tasks or just make life easier.

Due to the growing demand, connecting students to career pathways in manufacturing can help them find jobs with competitive pay, terrific health benefits, free or low-cost postsecondary opportunities, and plenty of potential for advancement. Educational requirements vary significantly, and pathways start as early as middle school and include high school programs, apprenticeships, certificates and associate degrees, and four-year bachelor's degrees. Students can major in many fields to prepare for manufacturing, 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.

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.

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

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.

Apprenticeship, Certification or Associate Degree

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.

Advanced Manufacturing Technician

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

Welder

Use welding equipment to assist in manufacturing assembly and production.

75%
of manufacturers are small: < 20 employees[9]

30 million jobs
with a median salary of $55,000 that don't require a bachelor's degree[6]

$27/hour
manufacturing workers earn on average[13]

Associate Degree or Bachelor's 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.

Advanced Degree

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!

20 percent of all jobs in the United States, or about 26 million jobs, require a "high level of knowledge" in at least one STEM field[16], and manufacturing encompasses STEM from design to distribution.

Just as there are many different jobs for people with diverse interests and talents, there are many different pathways to prepare students for a career in manufacturing. 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. You can help develop these skills in your classroom. Some manufacturing pathways start as early as middle school.

High school pathways can also help students fulfill graduation requirements and can lead to industry-recognized credentials and possible college credit. Depending on students' interest and training, they can enter the pathway at any level or work their way up throughout their career by earning more credentials, certificates or degrees.

Federation for Advanced Manufacturing Education (FAME)

FAME, the Federation for Advanced Manufacturing Education, is a collaborative of employers across the nation who work collectively to participate in and support the Advanced Manufacturing Career Pathways, including the Advanced Manufacturing Technician (AMT) Program. The goal of the AMT Program is to produce the global best new-to-field technician at the point of graduation. It is a career pathway program that is based on the technician path, with continuations into engineering and business. The hop-on/hop-off pathway allows participants to both seek careers that best fit their passion and to proceed as far along that career path as their talent and ambition take them. AMT starts with active engagement in the K-12 education sector, and continues with a 2-year associate degree program that includes 5-straight semesters of course work. The schedule involves 2 full days per week at school combined with a 3 full days at work. Employers first recruit students to the program from K-12, and then sponsor students through the AMT program by providing paid work experience during the 3 work days. Following completion of the 2-year/5-semester college phase, with the employer, and with satisfactory performance, a business need, and mutual agreement, graduates can then continue to permanent employment.

FAME stats:

- 11 States
- 27 Community College Campuses
- 4 Universities
- 700 Active Community College Students
- 265 Engaged Employers
- 80 % Full-time/On-time Graduation Rate

Source: http://fame-usa.com For more information about FAME, go to FAME-USA.com

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.

"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)[22]

Manufacturing jobs hold great promise for all Americans, especially women, people of color, people with disabilities, English Language Learners, and others who have historically been underrepresented or faced barriers to high paying jobs.

Manufacturers need people with a strong work ethic and technical skills. However, manufacturing jobs currently remain unfilled because employers cannot find skilled workers. You can help fill this skills gap by exposing students to the wide variety of careers and educational pathways available to prepare them for a secure and lucrative job in manufacturing.

NAPE designed this guidebook and accompanying student version to provide a realistic view of the diversity and opportunity in the manufacturing industry, so more students will take a deeper look. We hope you will find this guidebook useful and will facilitate the lessons with your students, so they can explore, plan, find and fund their futures.

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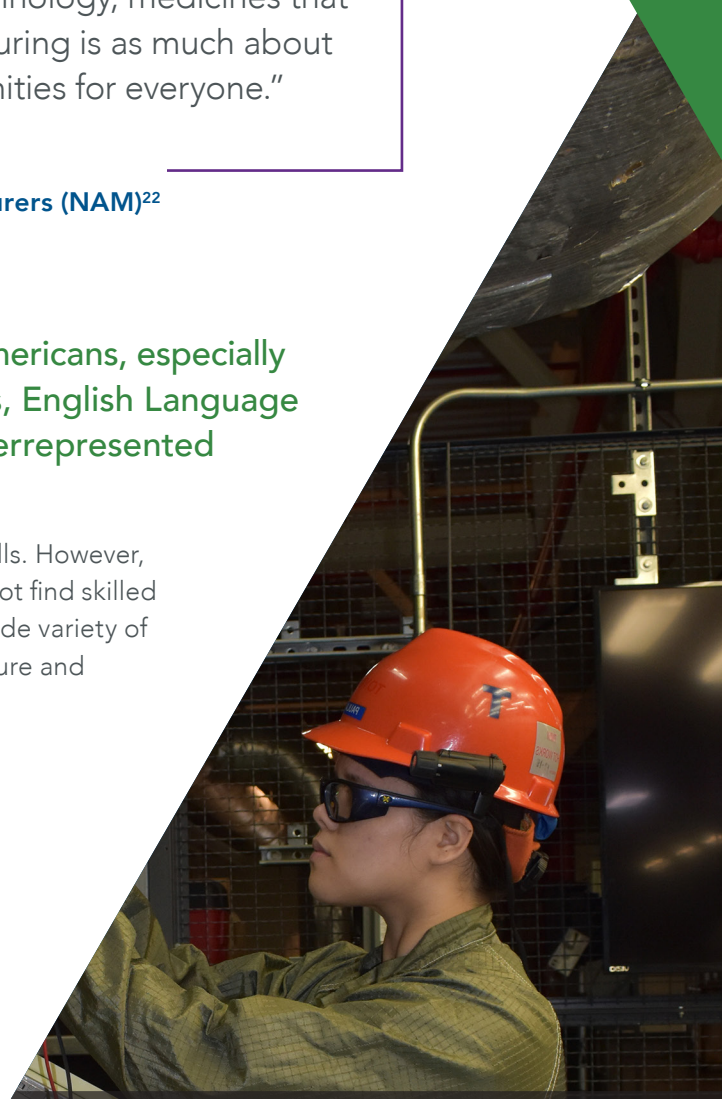

"The AMT program has taught me invaluable lessons. I moved to the United States with my family, seeking for opportunities for each of us, not very hopeful that I could be successful. Closer to my High School graduation I knew I wanted to pursue a technological career path, but I had various economical limitations. The AMT program helped me earn not only a degree, but also experience from a world class company as Toyota is.

I was "book-smart" but I lacked real-world experience. This program helped me put into practice all I learn such as how to wire and troubleshoot electrical, pneumatic and hydraulic circuits. I also learned the importance of soft skills and how crucial is effective communication to explain a problem to others.

This program led me to a successful career. I plan to further my education while I work for Toyota. I intend to keep ascending and contribute more to Toyota's technological advancements in the future."

~ Paula

Lesson Plans

The lessons in this guidebook are aligned to many states' Science/ Technical and Social Studies Grades 6-12 standards.

NAPE designed the activities to help broaden and deepen the information and learning from **Make Your Future: The US Manufacturing Industry, a Guidebook for Students and their Families.** Note that the lesson plans are best completed sequentially.

Equitable Instructional Strategies

Educators can help students consider a wider range of career paths, including manufacturing, by using equitable instructional strategies. Throughout the lesson plans, we have highlighted relevant strategies that increase motivation, engagement, and success for all students.

Lesson 1:
How It's Made

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Manufacturing Industry

Audience: Middle, high school or postsecondary students

Overview: This lesson asks students to consider how products are made. Without manufacturing, our dreams for a safe, more efficient, and better world would go unrealized. Students will consider all the people and processes involved in taking a dream to a reality.

Key Takeaways:

- Creating a product from a dream is a multistep process that requires a number of people doing a variety of jobs.
- Different parts of the manufacturing process have jobs that connect to a wide variety of character traits and skills.

Guiding questions:

- How does manufacturing turn good ideas into safe products?
- What kinds of jobs exist in manufacturing and which ones would be a good match for me?

Activity 1

Time needed: 30 minutes

Learning Objectives:

- Brainstorm and identify all of the steps required to transform an idea into a product.
- Identify manufacturing jobs that appeal to the learner.

Instructions:

1. Explain to students that making a dream a reality through manufacturing is a team effort. Model this by having students work in teams.

Intentionally Select Teams

Teams with only one student from a marginalized ethnic, racial, or gender group can be isolating and create a negative experience for the student.[15] Beyond considering social, academic, and behavioral aspects when creating student teams, try to keep at least two students from any one group together if possible.[15]

2. Ask teams to select an object from the room. It can be a piece of clothing one of them is wearing, a pencil, a chair, a smart board, or any other item already in your room. Give students 15 minutes to brainstorm all the steps required to make that product. Ask them to put the steps in order.

3. Divide the board into sections with the following job functions:
   - Product Design
   - Process Design
   - Production
   - Quality Assurance
   - Distribution/Inventory Management
   - Customer Support and Sales

   Direct students to compare the job functions on the board with their own steps and find similarities.
4. Pass out ***Make Your Future: United States Manufacturing Industry, a Guidebook for Students and their Families.*** Give students 5 minutes to preview text through the pre-reading strategy: reading-across-the-text.
   a. Ask students to look at pictures and captions. Ask: What inferences or predictions can you make about the content in the guidebook?
   b. Have students look at the graphics or charts. Ask: What types of information do the graphics provide? What do the graphics tell you about the types of information that will be in this guidebook?
   c. Ask students to look for indications of big ideas such as words or headings in bold type. Ask: Do these words give any clues about the subject or main idea?
   d. Ask students to read the first paragraph of the text (introduction) and the last paragraph (conclusion). Ask: What do you think the purpose of the guidebook is? Based on that purpose, what are the key pieces of information you are going to pay attention to during your reading?
5. Direct students to the manufacturing operation depicted on pages four and five. Discuss whether or not students identified all the steps, jobs, and people needed to turn an idea into a product. Point out aspects of manufacturing that were overlooked, and the hidden processes found in production, quality control, distribution, and other manufacturing steps.
6. Have students identify the job functions from the list on the board that are most interesting to them. You will use this information for the next activity.
7. Ask students to reflect on key takeaways from this activity. Share out responses and conclude by highlighting how creating a product from a dream is a multistep process that requires a number of people doing a variety of jobs.

Connection to the Standards

Consider assessing this assignment using Speaking and Listening, Comprehension and Collaboration standards from your state. Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.

Visit https:napequity.org/make-the-future for additional resources and downloads.

Activity 2

Time needed: 30 minutes

Learning Objectives:

- Identify necessary STEM skills and knowledge, and personal characteristics that correspond to specific job functions
- Share stories about people who have STEM skills, knowledge, and characteristics
- Compare and contrast the required skills, knowledge, and characteristics of various manufacturing jobs

Instructions:

1. Make copies of the Required Skills and Knowledge Worksheet on page 12 for your students.
2. Group students based on their preferred job function from Activity 1 (Instruction #6). Ask groups to discuss and create a list of the Science, Technology, Engineering and Math (STEM) skills and knowledge required for their chosen job function, and the personal characteristics required for team members who work on this step in the manufacturing process. Prompt students to consider characteristics such as creativity, collaboration, and problem-solving. Provide students with the Required Skills and Knowledge Worksheet on page 12 to help record answers. Use the following strategy to help students work collaboratively:
    a. One student leads the discussion about required science skills and knowledge. The student to the group leader's right takes notes and the person to the left keeps time. Give the group a minute to brainstorm science skills required.
    b. Rotate to the next student so the time-keeper now leads the discussion around required technology skills and knowledge. The student on their left becomes the time keeper, and the former group leader becomes the note taker.
    c. Keep rotating through the other two STEM skills and the personal characteristics, so all students have a chance to lead, take notes, and keep time.

Rotate Roles

Student roles within a team can be dictated by gender or racial stereotypes. Allowing students to choose their roles initially provides them with some level of comfort. However, requiring students to rotate roles is also important so that they learn new skills. Role rotation also keeps students from feeling limited by gender or racial norms.[15]

3. Ask students to share stories about people they know who work in manufacturing or who possess the skills, knowledge, and characteristics they identified. If students struggle to identify people, provide them with time to research biographies, interview professionals, or invent a character and create a story of how that person's skills and traits led them to the career. Prompt students with the following questions about the person: What jobs do they do? Do they like their jobs? How do they use STEM skills in their jobs? Why do they find their jobs fulfilling or don't they?
4. Facilitate a discussion to uncover similarities and differences of skills and traits and characteristics employed at each step of the manufacturing process.
5. Ask students to reflect on key takeaways from this activity. Share out responses and conclude by highlighting how different parts of the manufacturing process have jobs that connect to a wide variety of character traits and skills.

Required Skills and Knowledge Worksheet

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Instructions: Use the table below to help identify skills and knowledge required to be successful in your chosen job function within a manufacturing field.

Science Skills and Knowledge	Technology Skills and Knowledge	Engineering Skills and Knowledge	Math Skills and Knowledge	Personal Characteristics
What science skills and knowledge are needed in your phase of manufacturing process?	**What tools and technology are used at your phase of the process?**	**What engineering skills and knowledge are needed in your phase of the process?**	**How does math inform this stage of manufacturing?**	**What people skills, communication skills, problem solving skills, and other characteristics are required at this phase of the production?**
Example: The designers of baby formula (ex. Abbott Labs) would need to know a lot about nutrition and chemistry to get the formula correct.	Example: A CNC operator would need to use a computer program to program a machine.	Example: An industrial engineer would need to design automation to make the production process more efficient.	Example: Quality control would use ratios and probability to determine waste and how well the factory is producing a safe and quality product.	Example: During the design phase, people would need to successfully work alongside others in teams and identify and solve a variety of problems.

Lesson 2:
Where It's Made

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Manufacturing Industry

Audience: Middle or high school students in any academic course

Overview: This lesson asks students to familiarize themselves with the many products made in the United States and identify products they might be interested in making.

Key Takeaways:

- US companies manufacture a wide variety of products.
- Students with a variety of interests have opportunities in United States' manufacturing companies.

Guiding questions:

- What kinds of products are made in the United States?
- What kinds of products are made in your county or region?
- Where are products made in the United States?
- Which kinds of products would I like to make?

Time needed: 90 -120 minutes (2 class periods for group work and 1 class period for presentation)

Learning Objectives:

- Research products manufactured in the United States and identify skills and education needed to create the product.
- Reflect on skills, knowledge and characteristics required to create specific products.
- Present findings using visual cues.

Instructions:

During this lesson, student groups will research and present information about products in a chosen industry using a "presentation in a bag" approach, with each student becoming the "expert" in their selected area. For a "presentation in a bag," students will decorate a paper bag and place images, objects or word art inside it. The bag then serves as a visual aid to help them structure their presentation. As students describe the industry they explored and its US-made products, they will be able to point to images and words on the outside of their bags. As they detail the skills, education, and characteristics of the people who specialize in each step of the manufacturing process, they will pull images or objects out of the bag to help guide their discussion.

1. Review the key takeaways from lesson one:
    a. Creating a product from a dream is a multistep process that requires a number of people doing a variety of jobs
    b. Different parts of the manufacturing process have jobs that connect to a wide variety of character traits and skills

The Power of Story Telling

While using a storytelling approach may take a little time, it is a powerful way to engage students, especially those from Native American, African, Latino and Asian cultures.[8,12]

2. Put students in groups of six and ask each of them to pick one step of the manufacturing process from the list below. Each member of the group will become an "expert" in a different step.
   - Product Design
   - Process Design
   - Production
   - Quality Assurance
   - Distribution/Inventory Management
   - Customer Support and Sales
3. Have students search for a list of products made in their state and choose one type of industry (e.g., textile, clothing, food, aerospace, automotive, etc.), and identify three US-made products in that industry to explore further, with at least one made in their county or region. If possible, in class or as homework , have students go to the websites of the companies that make those products to explore them further.*

Real World Connections

Skills and content that are connected to real-world outcomes can motivate students to engage in learning.[17] Authentic learning contexts, such as the ones presented here, are especially effective for women, who have historically been under-represented in STEM.[3] Whenever possible, make learning matter by tying it directly to your community.

4. Distribute paper lunch sacks to each student and ask them to label the bag with the industry and the step in the manufacturing process they explored. For example, a bag label might be automotive production or textile quality assurance. Have them decorate the bags with words or pictures that best represent the products they explored and the processes that happen during their chosen step of manufacturing. Direct them to the student guidebook as a resource.
5. Once "experts" have considered the steps involved in making their products, ask them to consider the people who do those steps. Have the "experts" explore the skills, characteristics and education that the industry team members working on their step of manufacturing would need. Ask them to create or find five or six images they can put in their bag and use to help them discuss what they learned about the people who make their products.
6. Each group will then share the US products they investigated and the steps taken to manufacture their products. Line up group members in order (from product design to distribution/inventory management) with their bags. Starting with product design, have each "expert" describe what step in the manufacturing process they investigated using the pictures and words on the outside of the bag as visual aids. Then, instruct them to pull each image or object out of the bag one at a time and share how it relates to the education, skills, and characteristics of the people who make that step happen.

*If you give this as homework, please ensure that every student has access to an Internet-enabled device.

7. Once students have presented, facilitate a conversation about the commonalities in manufacturing across industries and how they represented the people in various jobs. Did they select more men than women? Did they select more people with four-year degrees? Remember, many jobs in manufacturing require other postsecondary pathways, such as apprenticeships, employer-based training, certificates, and associate degrees. What biases come to the surface about the people they imagined? What biases about manufacturing or the people who work in manufacturing did the project help them overcome?

Connection to the Standards

Consider assessing this assignment using your state's college and career ready standards related to speaking and listening or consider the standards below as criteria for the assignment.

Comprehension and Collaboration

1. Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
2. Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.
3. Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.

Presentation of Knowledge and Ideas

4. Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.
5. Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.
6. Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate.

Lesson 3:
What Career Would Make my Future?

NAPE
National Alliance for Partnerships in Equity

Manufacturing Industry

Audience: Middle, high school or postsecondary students in any academic course

Overview: This lesson asks students to explore various jobs they might find interesting in the manufacturing industry.

Key Takeaways:

- Discover potential career pathways in manufacturing.
- Identify educational pathways to various jobs within manufacturing.

Guiding questions:

- What manufacturing jobs might I enjoy?
- How do I prepare for them?

Time Needed: 45-60 minutes

Learning Objectives:

- Complete a career cluster inventory and match interests to manufacturing jobs.
- Calculate a necessary salary based on interests and lifestyles.
- Identify careers that satisfy interest and salary requirements.

Instructions:

1. Open the lesson by reminding students of the variety of jobs and job functions required to make a dream into a product. Introduce career cluster inventories, which are surveys that can help students target their career aspirations based on their interests and aptitudes. Remark that the survey may help students find the right match between their interests and the various jobs in manufacturing.
2. Direct students to state resources that describe the manufacturing jobs in your state. Have them look for information about the education and skills they need to attain those jobs.

Student-Centered Learning and Student Agency

Whenever possible, have students self-select topics and do the work to uncover ideas and apply knowledge themselves, rather than receiving information from a teacher. This process of active learning increases academic achievement[7,10], motivation, higher-order thinking, and skill development[4], and is particularly powerful to engage historically under-represented people in STEM, such as women and girls.[14]

3. Have students research how much money they need to make to support themselves. By answering key questions about their interests and lifestyles, students learn what target salary they would need to be financially stable. This target salary can help them select the right career in manufacturing.
4. Individually or in groups, have students explore state resources to gather information about careers in manufacturing that match their interests and salary requirements. You might group students based on the steps of manufacturing they found most interesting in the first activity (Product Design, Process Design, Production, Quality Assurance, Distribution and Inventory Management, or Customer Support and Sales).
5. Ask students to select two to three jobs they want to explore further and justify their choices. If possible, have the students do an online search for websites or YouTube videos about the jobs that they are interested in.
6. Have students create a table like the one below with information about each job they selected.

Jobs	Tasks I would do at my job	Tools and technology I would use	Knowledge and education I would need	Skills, abilities, and training I would need	Credentials or training certificates I would need	Average wage	Job openings in US
1.							
2.							
3.							

Connection to the Standards

Consider assessing this assignment using your state's college and career ready standards related to research and writing or consider the standards below as criteria for the assignment.

Research to build and present knowledge

7. Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.
8. Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.
9. Draw evidence from literary or informational texts to support analysis, reflection, and research.

Lesson 4:
How I Will Make My Future!

NAPE
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Manufacturing Industry

Audience: Middle, high school or postsecondary students in any academic course

Overview: In this lesson, students will synthesize what they learned about various types of manufacturing in the United States, what kinds of jobs are needed in those sectors of manufacturing, and what types of jobs they might want to pursue. They will create a personal plan to prepare themselves for their dream job in a manufacturing company. Note the sources we recommend are useful in all industries, not just manufacturing, so while we encourage students to explore manufacturing, this assignment could be useful to all students, including ones who already have career goals in mind.

Key Takeaways:

- A personal pathway toward a career in manufacturing.
- A plan for funding their pathway.
- A reflection of the essential skills they need for their future in manufacturing.

Guiding questions:

- What education and training will I need to reach my career goals?
- What educational pathway might be the best approach for me?
- What essential skills should I focus on developing as I prepare for my future?

Preparation:

1. Invite the school counselor and a recruiter from a local career center to talk with your students about academic opportunities and pathways for day 1.
2. Invite a speaker(s) from one or more companies in your area, particularly a young professional for day 4. It's important for students to see themselves mirrored in role models, so be conscious of this when choosing. Your local Economic Development organization might be helpful in making a connection.
3. Make copies of the nine essential skills table included on page 20 of this guidebook. Provide copies of *Good Jobs that Pay Without a BA* (https://goodjobsdata.org/wp-content/uploads/Good-Jobs-wo-BA.pdf).[6]
4. Note that Days 1 and 3 require computer access, but you can put students in groups if you do not have access to individual devices for each student.

Time needed: Four 45-60 minute class periods (could be facilitated individually or connected as part of a research and career exploration unit)

Learning Objectives:

- Identify the skills and knowledge needed to reach desired graduation requirements.
- Identify a postsecondary pathway that leads to a desired career and explain rationale for this pathway
- Create a plan to fund desired postsecondary pathway

Instructions:

Day 1: What can I do now?

1. Invite your school counselor and a recruiter from a career center to talk with your students about opportunities and academic pathways. Ask them to prepare a 20-minute presentation and the leave time for questions.

Using Diverse Role Models

Role models can have a big impact on students' beliefs about what they can accomplish. Teachers use models frequently: when guest speakers visit a class (such as in this lesson), when you ask students to demonstrate a skill, or through videos, posters, textbooks, and other curricula. When models are similar to students, the students find it is easier to envision themselves completing the task or working in the field successfully.[19] Certain characteristics make role models more effective: perceived similarity with the learner, credibility, enthusiasm, and competence through effort rather than innate ability.[2,5,18,20] Be purposeful about the models you use and try to include diverse models that represent the diversity in your classroom.

2. Using presentation handouts, course planning documents from your school, and the Internet, ask students to list courses they need to take to graduate and additional courses, electives, or activities that would help them prepare for their career path, including Career and Technical Education (CTE) courses.
3. Next to identified coursework, have students identify the specific skills and academic content in each course that will directly relate to their chosen career options. Remind them to look back at the STEM table they completed, which identified some of the academic and technical skills they need to develop. Make sure they consider the Career and Technical Education (CTE) Courses. Many states offer pathways for several types of engineering, including: Chemical Engineering, Electrical Engineering, Electronics Engineering, Engineering Management, Mechanical Engineering, Industrial Engineering, as well as Computer Science and Information Technology. Specific to manufacturing, there are pathways in Aerospace, Industrial Technology, Materials, Manufacturing Safety and Manufacturing Systems.

Day 2: What essential skills can I work to develop?

1. Distribute the Nine Essential Skills table found on page 20 and ask students to
    a. Rate themselves on each skill. You could do this activity individually or have them work in groups.
    b. Identify the classes and activities, including academic courses, CTE courses, electives, extracurricular activities, and other opportunities your school offers that build these essential skills.
2. Do a gallery walk to gather students' responses. For a gallery walk, create one poster per essential skill and hang them around the room. Give students two minutes at each poster to record their responses. If another student has already posted a particular response, ask students to put a star next to it. This will allow you to see the frequency of the responses and will help you keep the poster a bit more organized and easy to interpret.
3. Conduct a discussion about which responses were cited most often (based on which ones have the most stars) and discuss how these essential skills are worthwhile for any career.

Lesson 4: How I Will Make my Future!

Nine Essential Skills

Essential Skill	What it is	How I rate myself on a scale of 1-5 with 1 as excellent and 5 as needs a lot of work	Classes and activities that will help me develop this skill
Reading	Improving your skills and knowledge on a regular, ongoing basis		
Document Use	Reading and interpreting documents to extract information		
Numeracy	Working with numbers to perform calculations		
Writing	Conveying ideas by writing text		
Oral Communication	Conveying or exchanging information verbally		
Working with Others	Interacting with co-workers to get the job done		
Thinking	Finding and evaluating information to make decisions, solve problems, and plan and organize job tasks		
Digital Technology	Using technology to solve problems and complete tasks		
Continuous Learning	Performing tasks that call upon greater memory use than most jobs		

The 9 Essential Skills. (2017). Retrieved from http://www.wem.mb.ca/the_9_essential_skills.aspx

Day 3: Make it and Fund it!

1. Distribute ***Good Jobs that Pay Without a BA*** (https://goodjobsdata.org/wp-content/uploads/Good-Jobs-wo-BA.pdf).[6] Students could either complete this reading as a homework or read it in class. NOTE: This reading could also be useful and inform questions students might have for a recruiter or school counselor. You might consider having it as pre-reading for the Day 1 lesson.
2. Refer students to ***Make Your Future: United States Manufacturing Industry, a Guidebook for Students and their Families*** for additional information. Discuss the misconceptions students have about postsecondary pathways.
3. Ask students to identify one or more postsecondary pathways that would lead them to the careers they selected for their personal plan.
4. As students are researching, remind them that not all jobs require, or give preference to 4-year degrees. A number of pathways lead students to credentials and on the job training, so they can learn and earn simultaneously. Each pathway has different costs associated with it, so students should be sure to consider their most sensible and affordable pathway to their future in manufacturing. Remind students of any information related to education and job training that the local career and technical center recruiter or school counselor provided.
5. Have students synthesize what they learn in a persuasive essay where they identify their pathway and justify why it is the best option for them.

Day 4: Who else does these jobs?

1. Invite a speaker(s) from one or more companies in your area, particularly a young professional. Its important for students to see themselves mirrored in role models, so be conscious of this when choosing. Your local Economic Development organization might be helpful in making a connection. Ask them to prepare a 20-minute presentation and leave time for questions.
2. Ask the speaker(s) to bring in a hands-on activity or demonstration that would allow students to kinesthetically experience their particular product or to help them understand manufacturing in general.
3. The Educator Guide from the Manufacturing Institute has a variety of activities for teachers or speakers to use to introduce manufacturing to students. http://www.themanufacturinginstitute.org/Image/Dream-It-Do-It/Educator-Guide/~/media/23704020662B473EB5E024C55481BF09.ashx

Educator Resources
for Exploring Jobs in Manufacturing

NAPE
National Alliance for Partnerships in Equity

In addition to the Student Resources for Exploring Jobs in Manufacturing which follows, below are other resources to help educators introduce opportunities in manufacturing to students:

American Production and Inventory Control Society (APICS)
www.apics.org/stem/about/the-program
Supply Chain STEM Educational Outreach Program

How Everyday Things are Made
manufacturing.stanford.edu/hetm.html
A website that provides information and videos about how different things are made

Good Jobs that Pay without a BA
goodjobsdata.org/wp-content/uploads/Good-Jobs-wo-BA.pdf

Manufacturing Day℠
www.mfgday.com
Manufacturing Day is a celebration of modern manufacturing meant to inspire the next generation. Go to the site anytime to find companies registered for manufacturing day activities to connect with one in your area.

The Manufacturing Institute
www.themanufacturinginstitute.org/Image/Dream-It-Do-It/Educator-Guide/~/media/23704020662B473EB5E024C55481BF09.ashx
This Educator Guide from the Manufacturing Institute is a rich resource for teachers or speakers to use to introduce manufacturing to students.

National Society of Black Engineers
www.nsbe.org/home.aspx
Great source for African American role models for classroom speaking engagements.

Project Lead the Way
www.pltw.org
Information about K-12 Pre-engineering curriculum.

Society of Hispanic Professional Engineers
programs.shpe.org
Focused on narrowing the disparities of Hispanic students in STEM. A great source for role models for classroom speaking engagements.

Society of Manufacturing Engineers
www.sme.org/mfgis-video/
A great resource for videos showing diverse role models and how Manufacturing makes a difference in the world.

Society of Women Engineers
neohio.swe.org/outreach.html
SWE-Next engages with female students under the age of 18 to register and learn about careers in engineering. Also, a great source of role models for classroom speaking engagements.

STEM Jobs
www.stemjobs.com
Connects today's students with the in-demand careers of tomorrow in STEM. Provides solutions for teachers to help their pupils realize that STEM exists in everything.

STEP Ahead: Women in Manufacturing
www.themanufacturinginstitute.org/Initiatives/Women-in-Manufacturing/STEP-Awards.aspx
The Manufacturing Institute launched the Science, Technology, Engineering and Production (STEP) Ahead initiative to showcase the impact of women in manufacturing to help attract and retain the talent that the industry needs to succeed.

Teach Engineering
www.teachengineering.org/curriculum/browse?q=manufacturing
TeachEngineering is a searchable, web-based digital library collection populated with standards-based engineering curricula for use by K-12 teachers.

Try Engineering
tryengineering.org/play-games
A website which engages students to learn about engineering through the use of games.

Women in Manufacturing
www.womeninmanufacturing.org/aboutmain/about
This organization, headquartered in Independence, Ohio is a great source for female role models to speak to students.

You Tube about Manufacturing:

- **Millennials' Thoughts on Manufacturing (The National Association of Manufacturers - NAM)**
  www.youtube.com/watch?v=wk4SjFWD6tg
- **What Does Manufacturing Mean to Me (The National Association of Manufacturers - NAM)**
  www.youtube.com/watch?v=OJo1xlppqzg
- **Dream It. Do It.**
  www.youtube.com/watch?v=pURx4I0LfK0
- **Dream It. Do It.**
  www.youtube.com/watch?time_continue=82&v=1af5N6EZbD4
- **What's so Cool about Manufacturing – A series of Career Spotlight videos about different jobs within Manufacturing**
  www.youtube.com/user/dreamitdoitpa

Student Resources
for Exploring Jobs in Manufacturing

NAPE
National Alliance for Partnerships in Equity

To learn more about manufacturing careers visit:

Careers in Welding
www.careersinwelding.com
Resources to help students and parents follow the right path to a welding career along with tips for counselors and teachers on guiding students toward welding careers.

Dream It Do It
www.themanufacturinginstitute.org/Image/Dream-It-Do-It/Dream-It-Do-It.aspx
Dream It. Do It. works to change the perception of the industry and inspire next-generation workers to pursue a manufacturing career.

Engineering Go For It
students.egfi-k12.org/category/explore-engineering/manufacturing-explore-engineering/
This website allows students to learn about different types of Engineers - where they work and how they make a difference. It also provides resources for educators.

How Products are Made
www.madehow.com
This website explains the manufacturing process of a wide variety of products.

Project Lead the Way
www.pltw.org
Information about K-12 Pre-engineering curriculum.

Try Engineering
http://tryengineering.org/play-games
A website designed to engage students to learn engineering through the use of fun, engaging games.

Search on YouTube
"Cool Stuff Being Made" or "Manufacturing and Engineering Jobs Are in Demand"

To develop your career plan visit:

Advanced Manufacturing Competency Pyramid:
www.careeronestop.org/competencymodel/competency-models/advanced-manufacturing.aspx
The Competency Model Clearinghouse (CMC) is a website sponsored by the U.S. Department of Labor, that explains specific skills needed for different types of careers.

Manufacture Your Future
www.manufactureyourfuture.com
Provides students, families and educators with materials to cultivate an interest in manufacturing.

My Next Move
www.mynextmove.org
This website directs students in finding careers that fit their interests.

National Association of Manufacturers Skills Certifications
www.themanufacturinginstitute.org/skills-certification/certifications/nam-endorsed-certifications.aspx
This website lists different manufacturing certifications.

O-NET
www.onetonline.org
Provides information about careers, including manufacturing.

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.

Tanya

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

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