

Manufacturing Your Way to a **Brighter Future**

Grades 9-12

CA VES | FLATE

This lesson explores the potential of finding a career in manufacturing while challenging students to consider and use science and engineering principles.

It is designed to be used with the EducateWorkforce course “Exploring Advanced Manufacturing” developed through a partnership between two National Science Foundation Centers for the Advancement of Technological Education, CA²VES and FLATE. It is important for students to be exposed to as many career options as possible to help them find what best suits their talents, interests and skills.

Lesson Objectives:

After completing this course, the learner will be able to:

- Explain how modern advanced manufacturing differs from common perceptions of the manufacturing industry
- Describe what you would see in a modern manufacturing facility
- Differentiate between various career pathways within the manufacturing industry including: production, maintenance, quality assurance, logistics, process development, and safety
- Describe the education and skill requirements needed to have a successful career in manufacturing
- Compare average manufacturing salaries to the average salaries in other industries

Level:

Grades 9-12

Lesson Duration:

Three 45-minute class periods. Can be condensed or extended as needed.

Summary of Tasks/Actions:

Day 1 – Exploring Advanced Manufacturing

1. 5 min — Introduction

As a possible hook into the lesson, start a brief discussion by asking the students to brainstorm as a whole class what they think technology is. Collect examples in classroom of old technology to get them thinking (a pencil, a fork, a book). There is no need here to finish the discussion here, just get the students thinking. Familiarize the students with the navigation of the course, pointing out how they access the eBook (you may want to have this downloaded for them beforehand), and courseware. Go over the course introduction, goals, and objectives with them briefly, highlighting how this course is relevant to them.

2. 15 min — Exploring Advanced Manufacturing

Have the students explore the first module, watch the videos, read the accompanying ebook pp. 1-8 for more information, and complete the “Perceptions of Manufacturing Activity,” “Manufacturing Sectors Activity,” and “Careers in Manufacturing Activity.”

3. 10 min — Introduce and watch the TED talk video “How I built a toaster from scratch.” ” (see handout for link)

Revisit your earlier conversation about technology and ask the students how hard it would be to make a pencil if there were no more pencil factories? How hard would it be to make a toaster?

Summary of Tasks/Actions (cont.):

Day 1 – Exploring Advanced Manufacturing (cont.)

4. 15 min — Toaster video discussion activity

Ask the students to discuss in their groups the question, “How is manufacturing important in our everyday lives?” Give the students time to think, discuss, and share with one another in partners or small groups before asking for some ideas from the whole group. (See *Student Handout: Toaster Video Discussion*).

Day 2 – Manufacturing Career Clusters

1. 15 min — Explore the “Manufacturing Career Clusters” module

Explore the module by reading the material and watching the videos.

2. 20 min — Make a graphic organizer comparing the education, responsibilities and skills of two or three manufacturing career clusters.

Have them explain which cluster appeals to you the most (See *Student and Teacher Handout: Graphic Organizer for Careers*). This could be done as another group activity or individually.

3. 10 min — End to the lesson

As an end to the lesson, ask the students to explore the “A Hands-on Virtual Experience” section of the course. This gives them a taste for virtual reality which will likely be a big part of their future work experience.

Day 3 – Next Steps

1. 20 min — Next Steps Exploration

Have the students explore the content, videos, and links in the Next Steps portion of the course.

2. 25 min — Identify people in your community who work in manufacturing and ask if they would be willing to be interview subjects.

Your experts may not be easily accessible for students to interview, and so creating an email survey may be more practical. Divide students into groups to write interview questions using Google docs (for in person interviews) or Google Forms (for an email survey). Students will likely need help writing questions. Scaffolding this by brainstorming as a whole class or in groups, suggesting question categories, and providing examples will be helpful to them (See *Teacher Handout: Interview Activity*).

3. Going Beyond

Have the student groups put the data they collect into a graph to visually represent the response of the people that they interviewed. Have them analyze their data by drawing 2-3 conclusions on what it tells them about a career in manufacturing?

Materials/Equipment:

- EducateWorkforce.com online course “EAM101 Exploring Advanced Manufacturing”
- “Exploring Advanced Manufacturing” eBook
- Access to Google Apps or similar applications

References:

- Center for Aviation and Automotive Technological Education using Virtual E-Schools (CA²VES)
- TED Talks video https://www.ted.com/talks/thomas_thwaites_how_i_built_a_toaster_from_scratch?language=en#t-11338

Take Home Task:

Interview someone you know who works in the manufacturing sector (student will need help formulating questions.)

Student Handout: Graphic Organizer for Careers

Make a graphic organizer comparing the education, responsibilities, and skills of two manufacturing clusters.

Cluster A: _____		Cluster B: _____	
Job 1: _____	Job 2: _____	Job 1: _____	Job 2: _____
What education do you need?	What education do you need?	What education do you need?	What education do you need?
What are the responsibilities?	What are the responsibilities?	What are the responsibilities?	What are the responsibilities?
What skills do you need?	What skills do you need?	What skills do you need?	What skills do you need?

Explain which job interests you the most and why it attracts you.

What skills or talents do you already have the will help you in this job?

What skills and education do you need to acquire or develop for this job? How will you acquire them?

What concerns do you have about preparing for this career?

Teacher Handout: Graphic Organizer for Careers

Make a graphic organizer comparing the education, responsibilities, and skills of two manufacturing clusters.

Cluster A: <u>Production</u>		Cluster B: <u>Logistics and Inventory Control</u>	
Job 1: <i>Machinists and Tool & Die Maker</i>	Job 2: <i>Industrial Production Manager</i>	Job 1: <i>Cargo and Freight Agents</i>	Job 2: <i>Production, Planning & Expediting Clerks</i>
What education do you need? • <i>High School</i> • <i>Professional Certifications</i>	What education do you need? • <i>Bachelor's Degree</i>	What education do you need? • <i>High School</i> • <i>Professional Certifications</i>	What education do you need? • <i>High School</i> • <i>Professional Certifications</i>
What are the responsibilities? • <i>Use blueprints and CAD files</i> • <i>Calculate dimensions</i> • <i>Align cutting tools and work pieces</i> • <i>Test completed tools or dies for quality and standards</i>	What are the responsibilities?	What are the responsibilities?	What are the responsibilities?
What skills do you need? • <i>Analytical</i> • <i>Math & computer</i> • <i>Mechanical</i> • <i>Technical</i>	What skills do you need?	What skills do you need?	What skills do you need?

Explain which job interests you the most and why it attracts you.

- *Answers will vary but try to encourage students to think about and explain why they are attracted to a particular job.*

What skills or talents do you already have that will help you in this job?

- *Answers will vary.*

What skills and education do you need to acquire or develop for this job? How will you acquire them?

- *Answers will vary but encourage students to begin planning how they would get needed education.*

What concerns do you have about preparing for this career?

- *Answers will vary.*

Teacher Handout: Interview Activity

Identify people in your community who work in manufacturing and ask if they would be willing to be interviewed or surveyed (either in-person or via email) by your students.

Divide students into groups to write interview questions using Google docs (for in person interviews) or Google Forms (for an email survey). Students will need help writing questions and showing them some of the example questions provided below, might be helpful to them.

You will want this to be a positive experience for your students that shows them the attractiveness of manufacturing as a career option. Vetting the potential interview candidates might be useful in ensuring this outcome. Students may want to interview family members or people they already know who work in manufacturing so this may not always be possible.

Rather than just giving the students questions with which to conduct the interview, encourage their conceptual thinking skills and creativity by having them write their own. Brainstorm as a whole class or in individual groups. Start by getting the students to think about what they want to find out from their interviewee and begin developing questions from there. Since class time is not an infinite resource, you may eventually need to give them some of the questions. You could require that certain percentage of questions be original.

Question Categories

- What work is like
- State of the industry
- Money and advancement
- Skills and experience

General Questions

1. What company/field of manufacturing do you work in?
2. What are your responsibilities?
3. Why did you choose job?
4. What do you find satisfying or fulfilling about your job?
5. What do you like the most about your job?
6. What do you like the least?
7. What skills/education/training do you need for this job?
8. What do you find challenging about your job?
9. Describe a typical work day.

Links for more information

- <https://mgt.buffalo.edu/career-resource-center/students/networking/mentorlink/40-questions-to-ask-in-an-informational-interview.html>
- <https://www.quintcareers.com/information-interview/>
- <http://bestcareermatch.com/interview-questions>
- <https://www.themuse.com/advice/3-steps-to-a-perfect-informational-interview>
- <http://www.collegecareerlifeplanning.com/Documents/4%20Career%20Planning/j%20Networking%20Internships/Questions%20to%20Ask.pdf>