Unit One addressed the big picture of labor market realities—which industries are growing, which are shrinking, and technology’s impact on the market. They learned about the different types of employers in Manufacturing and read about current issues that affect workers.

Unit Two addressed the inner workings of the job-seeker. What are her interests and passions? What kind of work environment will she enjoy? What careers should she consider based on what she knows about herself and what factors might influence someone making a career change? Students also learned to navigate career database websites, assess their own interests and conduct a group research project about careers in the Manufacturing sector.

In Unit Three students heard from Manufacturing workers themselves, through firsthand accounts and interviews from workers in text and video, and discussed what they learned. They also conducted further research on Manufacturing careers of interest.

In Unit Four students consider what it takes to prepare for a career in Manufacturing. They learn about common career pathways in the industry and consider how career movement happens in Manufacturing careers. What kinds of training and education opportunities are available for someone interested in this field?
1 • A MANUFACTURING CAREER MOVEMENT SERIES

Students learn about how career movement happens in Manufacturing and consider their own career trajectories and values.

1.1 • Thorn Winter’s Career Movement Story
Students read a story about education and career movement from a Manufacturing worker who reflects on his time in high school when his interest in the field began. Students learn about the different steps he took and choices he made along the way to discovering his true passion and ideal career.

1.2 • Extension Activity: Figurative Language in Thorn Winter’s Career Movement Story
Students learn about figurative language, in particular metaphor and simile. They find and discuss examples of figurative language in Thorn’s Career Movement Story and practice writing their own to share with the class.

1.3 • Thorn’s Career Map
Drawing on their experiences with map-reading, students consider the trajectory Thorn took and portray it as a map. They focus on the steps he took to move from one job to another.

1.4 • Multiple Paths: How Personal Factors Impact Career Movement
Delving more deeply into career pathways, students discuss the personal life factors that cause a worker to choose one path over another, considering their own goals and limitations.

2 • A TASTE OF TRAINING: READING AN EMPLOYEE SAFETY MANUAL

Students read a sample Manufacturing safety manual, practice note-taking, and check their comprehension through a quiz with reading, writing, and math problems.

3 • CUNY AND SUNY CAN GET YOU THERE SERIES: PROGRAMS IN MANUFACTURING*

Students learn about CUNY and SUNY certificate and degree programs in Manufacturing and practice using resources to research them, including the CUNY college websites.

*RAENs will provide regional adaptations.
3.1 • Researching CUNY Degree and Certificate Programs in Manufacturing*
Students learn how to navigate a college website to locate information about degree and certificate programs by searching one CUNY campus website for their Manufacturing programs.

3.2 • Understanding CUNY Degree Program Requirements*
Students read about a sample degree program at a CUNY college and discuss the relevance of general education requirements to the major.

3.3 • SUNY Certificate: Precision Machining (Tooling) Certificate Program at Monroe Community College*
Students read about a Manufacturing certificate offered at a SUNY campus practicing navigating the website, reading a program description, and developing questions based on what they read.

3.4 • How Do I Enroll in CUNY?*
Students learn the steps required to apply to CUNY certificate and degree programs.

4 • ADVANCING IN MANUFACTURING: ENGINEERING CAREERS
In groups students research one of five mid to high level Manufacturing careers in Engineering. They practice navigating and paraphrasing information from an online database, then present their findings to the class, critiquing their own and one another’s presentations.
A Manufacturing Career Movement Series

Students learn about how career movement happens in the Manufacturing sector using a personal narrative and considering their own trajectories and values.

**ACTIVITIES IN THIS SERIES**

1.1 • Thorn Winter’s Career Movement Story

1.2 • Extension Activity: Figurative Language in Thorn Winter’s Career Movement Story

1.3 • Thorn Winter’s Career Map

1.4 • Multiple Paths: How Personal Factors Impact Career Movement
Thorn Winter’s Career Movement Story

Students read and discuss the career movements of an experienced Manufacturing professional as he describes the path he took in Manufacturing. They track his education and career movements and consider the steps he took to move between each stage of his career.

PREP

• Read Thorn Winter’s Story

MATERIALS

• Thorn Winter’s Story reading
• Written Response: Thorn Winter’s Story handout

EXPLAIN

1 Have you ever thought about how experiences in your past can influence you years later, in ways you hadn’t imagined? Can you think of an example of that in your life?

2 Introduce Thorn Winter’s Story, explaining that Thorn Winter had a positive experience in high school that ended up leading him throughout his entire career. Thorn has held many jobs through his life: waiter, convenience store clerk, and builder, in addition to his career in Manufacturing. Today Thorn works in Manufacturing and runs his own business.

3 Distribute Thorn Winter’s Story and ask students to read it. While they are reading, they should annotate it, underlining parts they find interesting, surprising or confusing.

4 Once they finish reading, they should write two things they notice in Thorn Winter’s story, and two questions they have.

5 Distribute Written Response: Thorn Winter’s Story, and ask students to complete it.

6 When students are finished, ask them to discuss their answers in pairs.
Thorn Winter’s Story
Adapted from Thorn Winter

My introduction to Manufacturing was in a high school wood and metal shop in upstate New York. My shop teacher tasked me with developing a plan to produce toy wooden airplanes that would be donated to local families. This experience, and the shop teacher who guided me through it, chiseled an unbreakable set of features into my character. Responding to challenges with curiosity and excitement has been the key to my success.

My first job was clearing land with a chainsaw, digging in the earth, and assisting carpenters, electricians, and plumbers for my dad’s construction company. I got into some trouble and left high school early, but am glad I decided to start college right away. While pursuing my first degree I worked as a waiter and a convenience store clerk—jobs that I thought would be fun and a change from Construction. I was interacting with people and learning how to communicate with customers in a professional setting—something that even to this day doesn’t come easy. But I always focused and never just showed up.

I returned to Construction after college, realizing that I loved being outside, building with my hands, and seeing the direct result of my labor at the end of the day. I felt proud when a family came home and marveled at their new porch, new roof, or renovated bathroom. During the next few years I framed houses, laid tile and roofing, and detailed moldings, banisters, and other trim. I worked as a plumbing and HVAC tech for a bit, but that wasn’t for me. My favorite part of my work was design—the imaginative part that reminded me of what I loved so much about building those toy airplanes.

In the Spring of 2002 I started working with stone. I built stone structures and applied stone and other natural materials to interior and exterior designs. I worked for a great company with a friendly and successful leader. The homeowner market was booming, and “curb appeal” was the buzzword of the time. The company took on some high profile clients and my creativity was given a wider playground. I was the young experimenter again, shocking some clients and my boss, with leather and copper tile installations, creek-stone showers, and my favorite—stone sculpture. Business was good, the pay and the benefits were great, and I was—pardon the pun—a rock star, with work featured in Better Homes & Gardens and other homeowner media.

Then in 2012 the housing market crashed. I was the highest paid employee and was providing creative services at a time when the need was in decline. The company pulled back and I was cut. I’m still friendly with my former employer. It wasn’t his fault. Business is business and when someone opens up their table for you, you respect it, you appreciate it, and you don’t complain when the food runs out.
I took the opportunity to gain some more college credits but with plans to get married and eventually have kids, I knew I needed to get back to earning. I wanted to build a long-term career outside of Construction, to open up my employment opportunities in the future.

A friend working at Viking Industries in New Paltz, New York suggested I go in and apply. I did and I landed a forklift driving job at a considerably lower income level than I was accustomed to. But I chose to commit, hit the ground running, learn the environment, and work my way up. With my mind focused on the goal, I quickly learned to operate saws, presses, gluers, stitchers, and assemblers, and how to fix what went wrong on various machines.

Six months after taking the forklift position, I was promoted to Production Supervisor for the second shift. Viking introduced me to the Council of Industry and did a great job helping me to develop the skills needed to lead a team in this fast-paced and at times stressful environment. I was a fish out of water at first, accustomed to working on my own or with a small team where I called all the shots and had a bit more interpersonal leeway with my subordinates. I improved my interpersonal skills while hiring to build my team and giving feedback to improve it. I was once again experimenting with processes to be more efficient, to improve safety, and to raise our standards of quality. I learned more deeply about the mechanical and electrical maintenance of our machines. I worked closely with all of my operators to learn their machine with them and coach them toward higher efficiency and quality.

Manufacturing is very different from anything I’ve done in my past. It requires more discipline, more resolve, more problem solving, more communication. It requires me to grow every day in response to some new challenge. I was very fortunate to have had a mentor to guide me, and an experienced colleague who I was smart enough to listen to.

But it all came back to that shop class: No matter what struggle I came up against, I could stop for a moment, remind myself of the goal, and push aside the fear of failing. I began to gain more confidence in my abilities and my decisions. I learned more about the business of making boxes so that I could make even better choices for the company. I learned about inventory, sales, and design, and am always looking to expand my knowledge base as a whole to make myself more valuable.

No matter what I am doing, where I am working, or what chaos I am facing, I make my most difficult decisions with one tool—my work ethic. Work ethic isn’t just a buzzword, it’s a way of life. When you have it, you are thinking of how to serve, how to give the best, how to be what the moment requires, and how to follow through on promises. You don’t take setbacks personally and you lead the way through challenges. Nobody is perfect.

At this moment, I am working and learning even more at Viking Industries, and I also own and operate New Paltz Computer Repair. Once again, I am motivated to learn new skills and adapt new modes of thinking and feeling. I self-analyze, listen appreciatively to other people’s opinions about me, and make intentional choices to adapt to what my environment and the people in it need of me in the moment—whether it’s as an analyst, a laborer, a technician, a husband, a father, or a friend. This is what I love about Manufacturing and the iron-willed people working in it. I am challenged every day to become the boy in the shop class, facing problems and fear while thinking and acting beyond failure.
Written Response: Thorn Winter’s Story

Respond to the following questions in complete sentences, providing as much information as you can.

1. In his opinion, what did Thorn’s early jobs have in common?

2. Why was Thorn dissatisfied with his plumbing and HVAC jobs?

3. Why did Thorn lose his job as an interior and exterior designer?

4. Why do you think Thorn got a promotion after six months as a forklift driver?
5. Where in the reading does Thorn Winter talk about his work ethic? What does this term mean?

6. Describe the impact that Thorn’s high school shop class had on Thorn’s career.

7. Give one example of how the economy had a positive impact on Thorn’s career and one example of how the economy had a negative impact.

8. Would you like to have any of the jobs Thorn Winter has had? If so, explain which one and what interests you about this job. If not, explain why not.
EXTENSION ACTIVITY:
Figurative Language in Thorn Winter’s Career Movement Story

Students learn about figurative language, in particular metaphor and simile. They find and discuss examples of figurative language in Thorn Winter’s Career Movement Story and practice writing their own to share with the class.

*NOTE
This is an extension of the previous activity and can be done either before or after students discuss Thorn Winter’s Story.

PREP
Read Thorn Winter’s Story and locate the following uses of figurative language. Be prepared to discuss their meanings.

- “This experience, and the shop teacher who guided me through it, chiseled an unbreakable set of features into my character.”
- “The homeowner market was booming.”
- “The company took on some high profile clients and my creativity was given a wider playground.”
- “Business was good, the pay and the benefits were great, and I was—pardon the pun—a rock star, with work featured in Better Homes & Gardens and other homeowner media.”
- “Business is business and when someone opens up their table for you, you respect it, you appreciate it, and you don’t complain when the food runs out.”
- “I was a fish out of water at first”
- “I am challenged every day to become the boy in the shop class.”

MATERIALS
- Simile and Metaphor Definition handout
- Simile and Metaphor Examples handout
- Thorn Winter’s Story reading (provided in the previous lesson)
- Metaphors in Thorn Winter’s Story (prompt)
**Section 1.2**

**EXPLAIN**

1. Draw a two-column chart (T-chart) on the board and write “metaphor” on one side and “simile” on the other. Ask students whether they have heard these words before and if they know what these words mean.

2. Ask students if they can give any examples of either a metaphor or a simile and write their responses in the T-chart on the board.

3. Distribute the *Simile and Metaphor Definitions* handout and ask for two volunteers to read it aloud.

4. Once students have read the definitions and seen the examples, ask them again to try to provide additional examples they might have heard before.

5. Distribute the *Simile and Metaphor Examples* handout. Ask students to read it silently and discuss a few of the examples. Poll students about which ones they have heard before. Tell students that writers and speakers use metaphors to help readers/listeners visualize their words.

6. Write the following example on the board or verbally ask students:

   **What is the difference between these two sentences?**

   (A) She had a heart of gold.  
   (B) She was a very kind person.

   Students may say something like: *Statement A makes a stronger statement by creating an image that the reader or listener can see in his or her imagination.*

7. Once students are clear on the concept, ask them to re-read *Thorn Winter’s Story* and put a star next to as many examples of figurative language as they can find. In the margin they should rewrite the figurative language into literal or simple, direct speech. Remind students to use context clues to help discern the meanings. Discerning meaning through context clues is a skill students will be tested on for the TASC exam.

8. Once students are done, bring the class back together and ask for volunteers to share the metaphors they identified and to explain what they mean.

9. Distribute *Metaphors in Thorn Winter’s Story* and ask students to write on ONE of the prompts.

10. Ask for a few volunteers to share their response aloud with the class.
Simile and Metaphor Definitions

1 Simile

A simile makes a comparison between two items using the words *like* or *as*. The comparison makes a description more vivid or striking or easier to picture. A simile says to the listener that two things are similar. The key to recognizing a simile is identifying the word *as* or *like* in the comparison.

- The man was *like* a prowling lion.
- The man was *as* hungry as a bear.

If you know what a hungry bear might be like, you can imagine what the man feels or how he is acting. This comparison paints a picture in the listener’s mind.

2 Metaphor

Metaphors also make a comparison between two items, but they do not use *as* or *like* in the comparison. In a metaphor, one item is said to be the other item, as if the two items are equal, but this equality is not to be taken literally. Sometimes the comparison in a metaphor is clearly articulated. Other times, the comparison is implied.

- The man was a hungry bear, a prowling lion looking for prey.
- She jumped into a circus of activity once school started.

Excerpted and adapted from “Figure Friendly, How to Teach Your ESL Students about Figurative Language”;
http://busyteacher.oral16977-how-to-teach-fig urative-language-esl-students.html
**Simile and Metaphor Examples**

This is a list of well-known metaphors and similes. There are many more metaphors and similes, of course, some common and others less common because anyone can create them at any time—you too!

<table>
<thead>
<tr>
<th>Simile</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>as alike as two peas in a pod</td>
<td>identical or nearly so</td>
</tr>
<tr>
<td>as blind as a bat</td>
<td>completely blind</td>
</tr>
<tr>
<td>as big as a bus</td>
<td>very big</td>
</tr>
<tr>
<td>as big as an elephant</td>
<td>very big</td>
</tr>
<tr>
<td>as brave as a lion</td>
<td>very brave</td>
</tr>
<tr>
<td>as black as coal</td>
<td>completely black</td>
</tr>
<tr>
<td>as busy as a beaver</td>
<td>very busy</td>
</tr>
<tr>
<td>as busy as a bee</td>
<td>very busy</td>
</tr>
<tr>
<td>as clear as a bell</td>
<td>very clear</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Metaphor</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>a heart of stone</td>
<td>unfeeling, not very nice</td>
</tr>
<tr>
<td>That sound is music to my ears.</td>
<td>a pleasurable sound</td>
</tr>
<tr>
<td>He has the heart of a lion.</td>
<td>He has courage. He is brave.</td>
</tr>
<tr>
<td>I’m dead tired.</td>
<td>very tired</td>
</tr>
<tr>
<td>Love is a fragile flower.</td>
<td>Love is beautiful but delicate.</td>
</tr>
<tr>
<td>Our marriage is on the rocks.</td>
<td>We are having a difficult time in our relation.</td>
</tr>
<tr>
<td>She got cold feet the night before the wedding.</td>
<td>She got nervous and considered not going through with it.</td>
</tr>
<tr>
<td>New York City is often said to be a melting pot of people because it is so diverse.</td>
<td>There are many different kinds of people all living together in one place.</td>
</tr>
</tbody>
</table>
### Metaphors in Thorn Winter’s Story

In the space provided, respond to ONE of the two prompts below.

1. What effects are created by Winter’s use of metaphors (figurative language) in his story? How would the story be different if he had not used figurative language? Create a metaphor or a simile that describes something you learned about Thorn Winter.

2. What does Winter mean when he says “Business is business and when someone opens up their table for you, you respect it, you appreciate it, and you don’t complain when the food runs out?” This is an example of an extended metaphor—what do you think this term means? Why do you think he uses this as a metaphor?

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Thorn's Career Map

Drawing on their experiences with map-reading, students consider the trajectory Thorn took and portray it as a map. They focus on the steps he took along his career pathway.

**PREP**

- Be prepared to define the terms: **key**, **legend**, **symbol**, **feature**.
- Draw a Career Map based on Thorn's letter, according to the instructions below.

**MATERIALS**

- Chart paper and markers
- Teacher's map of Thorn's Career Movement

**DISCUSSION**

**Ask:** What is a map?

- A visual representation of a geographic location.

How is it used?

- For navigation. To learn how to travel between points, or how to find where you are, if you're lost.

Some maps have a key or legend. What does a key on a map usually tell you?

- It includes symbols that correspond to various types of landmarks on the map such as medical facilities and religious buildings.

Why is this important?

- It locates the landmark and identifies its purpose.

Have you ever used a bus map? What are some of the features and symbols on it and what do they represent?

- Example: Different colored lines representing different routes, symbols for terminal stations, express and local stops, dotted lines for detours or construction.

Have you ever used another kind of map? What kind? What was easy or difficult about using it? What are some symbols you might find on a map?

- Straight lines, dotted lines, triangles, circles icons for example of mountains or restaurants.

**KEY**

- Legend
- Symbol
- Feature
Draw Thorn’s Career Map

Divide students into groups to draw Thorn’s career map. Distribute the paper and markers to each group.

DISCUSS INSTRUCTIONS

1. Take out one piece of loose leaf paper for the group. In order, list the different places Thorn either studied or worked. Next to each, list anything Thorn did to help him move forward in his career.
   
   *Example: Learning skills in addition to the ones he needed for his current job.*

2. On a separate piece of loose leaf paper, draw a map as follows:
   
   - Write the places he studied or worked and draw a circle around each one.
   - Write the steps Thorn took to get to each point on his career path and draw a box around each step.
   - Draw dotted lines connecting the places and actions to show an order of progression.

3. Draw a legend or key, explaining what the circles, boxes and dotted lines mean.
Multiple Paths: How Personal Factors Impact Career Movement

Students consider what goes into choosing a career path. What would make someone interested in Manufacturing become a Welder as opposed to a Sales Representative? And in general, what personal factors impact how a worker will change careers?

**DISCUSS**

What life factors affect whether someone stays at an entry-level career in Manufacturing, or pursues higher-level careers that require degrees and/or advanced training? What life factors might play a role in the pathway workers take?

Write answers on the board.

- **Their interests**, for example, an interest in working with their hands or working with technical equipment.
- **Their time**. A career change might require a lot of training, which they might or might not have time for.
- **Family**. They might need to spend more or less time taking care of family members.
- **Money**. They might have to invest a good deal of money into their education.
- **Limitations**. They might find a particular career is too difficult physically.
- **Career exploration**. They might try a few different careers before they find one that is a good fit.
Write the following questions on the board. Put students into pairs and have them discuss the questions.

- How does family impact your career choice?
- How does time impact your career choice?
- How does money impact your career choice?
- How does interest or personality impact your career choice?
- What else impacts your career choice?
A Taste of Training: Reading an Employee Safety Manual

Students practice note-taking while learning about safety practices in a Manufacturing factory through reading an employee safety manual. After reading the manual, they assess their note-taking skills by taking a quiz using their notes.

PREP

• Read the *Genesee Manufacturing Corporation Employee Safety Manual*

MATERIALS

• *Genesee Manufacturing Corporation Employee Safety Manual* article
• *Quiz: Safety on the Job*
• *Safety on the Job* answer key

EXPLAIN

1 Manufacturing factories (also called plants) are fast-paced places filled with activity, machinery, equipment, and projects at various stages of completion. Safety on the job is the biggest priority in this sector. All Manufacturing workers receive safety training and have frequent safety inspections of their work areas to make sure conditions are safe. Each company creates an employee safety manual that workers use as a guide to help them stay safe on the job.

What are some potentially dangerous things you might find in a Manufacturing factory, also called a plant?

> Cutting tools such as saws, drills, grinders
> Chemicals
> Heavy equipment such as forklifts
> Breakable materials such as glass and ceramic

Often the first task for a Manufacturing worker is to read the safety manual and discuss it with his or her supervisor. Employees are generally not even allowed near the equipment until they’ve read the manual cover to cover.

2 Ask if any of the students in the class have worked in a Manufacturing job. If so, ask them to describe their experiences with the safety expectations and protocols (procedures).
Lesson Guide

Section 2

3. We’re going to read a sample safety manual from a Manufacturing company. As you read, you should underline important parts of the manual. On a blank sheet of paper, write down key concepts, important points, and things you want to remember. You will be able to use these notes to take a quiz on the manual, but you won’t be allowed to use the actual manual. Distribute Genesee Manufacturing Corporation Employee Safety Manual, and have students read and take notes as instructed.

4. Ask students to read the safety manual a second time. They should stop reading after each section to make sure they’ve underlined parts they think are important and to write notes that they can use during the quiz. Remind them not to underline everything, but rather to underline key words and phrases and make notes that summarize the main ideas or interesting points.

5. Ask students if they feel prepared to take a quiz about the manual. If not, explain that you will give them time to read the manual one more time. Students should add new information to their notes that they might have missed in the first two readings.

6. Ask students to put the reading away, and distribute Quiz: Safety on the Job. Ask students to take the quiz. Explain that they should work alone and use their notes to answer the questions.

7. Ask students to exchange papers and correct each others’ answers using their own notes along with the manual. Ask for volunteers to discuss their answers. You can use the answer key to support the discussion. Ask students to return their partner’s paper with corrected answers.

DISCUSS

• How was this experience of reading the manual, taking notes, and using the notes for information?

• What was challenging?

• What skills did you use?

• What kinds of information did you catch the second or third time you read the manual that you did not catch the first time?

• How can this activity be applied to other subjects?

• What did you learn about your note-taking?
1 - SAFETY ORIENTATION

Basic safety rules

- Never do anything unsafe in order to get the job done. If a job is unsafe, report it to your supervisor or foreman/forewoman. We will find a safer way to do that job.
- Keep guards in place at all times on operating machinery.
- Never operate a piece of equipment unless you have been trained and are authorized.
- Use your personal protective equipment whenever it is required.
- Working under the influence of alcohol or illegal drugs or using them at work is prohibited.

How and when to report injuries, including first aid kits and their locations

- If you are injured or become ill on the job, report to Hannah Vine, Director of HR.
- If first-aid trained personnel are involved in a situation where blood is present, they should:
  - Avoid skin contact with blood by using gloves (provided in the first aid kit).
  - Change clothing with blood on it after giving immediate help.
- In the event that blood comes into contact with your skin, wash the affected areas thoroughly with soap and water to remove blood.
- First aid kit locations at this jobsite include: break room; foreman’s office; outside every restroom.
2 - GENERAL SAFE WORK PRACTICES

**Personal Protective Equipment (PPE)**

- Suitable clothing must be worn; long pants, shirts with sleeves, and adequate foot wear.
- Hard hats, safety glasses or goggles must be used when a potential hazard exists. (Safety glasses must be ANSI Z87 or Z87.1).
- Hearing protection (earplugs or earmuffs) must be used in high noise areas.
- Gloves (as needed).
- You will be instructed on how to use and care for these PPE.
- Do not use equipment or attempt to do any of these tasks until you have received the required training and PPE.

**Housekeeping**

- Always store materials in a safe manner. Tie down or support materials if necessary to prevent falling, rolling, or shifting.
- Trash piles must be removed as soon as possible. Trash is a safety and fire hazard.
- Do not block aisles, traffic lanes, fire exits, gangways, or stairs.

**Machine Safety**

- Do not remove, alter or bypass any safety guards or devices when operating mechanical equipment.
- Do not try to stop a piece as it goes through any machine. If the machine becomes jammed, disconnect the power before clearing the jam.
- Long hair must be contained under a hat or hair net.

**Ladder safety**

- Do not use ladders as skids, braces, workbenches, or any purpose other than climbing.
- Always face the ladder when ascending and descending.
- When leaning a ladder against a wall, the distance between the foot of the ladder and the wall is important. This distance should be one quarter of the working length of the ladder.
- All straight or extension ladders must extend at least three feet beyond the supporting object when used to access an elevated work area.

Welding, cutting and brazing
- Do not leave oily rags or other combustible materials in the welding, cutting or brazing area.
- Do not use worn, burnt or cracked hoses.
- Do not wear contact lenses when welding.
- When welding, wear a welding helmet with filter plates and lenses, welding gloves, a long sleeve shirt, long trousers and an apron.

General rules for handling chemicals
- Read all label warnings and instructions.
- Always wash your hands after handling chemicals.
- If a chemical enters your eye(s), immediately hold open the injured eye(s) and rinse it/them with clean, cool water for 15 minutes.

Using Display Screen Equipment (DSE):
- Position your monitor at, or slightly below, eye level.
- Move your eyes when viewing the screen as opposed to moving your head.
- Adjust your computer chair so that your forearms are horizontal to the desk, with your elbows at right angles.
- Adjust your monitor’s resolution, brightness and contrast to avoid eyestrain.
QUIZ: Safety on the Job

Answer the questions below in as much detail as you can.

1. What does “PPE” stand for and what are two examples of it?
   
   PPE stands for: _____________________________________________

   Two examples of PPE are:
   1. _______________________________________________________
   2. _______________________________________________________

2. What should a worker do if he or she thinks a task is unsafe?

3. Name two things that should be done in a situation involving blood:

   1. _______________________________________________________
   2. _______________________________________________________

4. Why is it potentially dangerous to block aisles, traffic lanes, fire exits, or gangways?

5. Why does long hair need to be contained under a hat or hair net?
6. What is one acceptable way for a ladder to be supported at the bottom?

7. If a ladder is 16’ (16 feet) tall, what is the required horizontal distance from the wall to the bottom of the ladder?

8. If there is a 7’ (7 foot) distance between the wall and the bottom of the ladder, how tall can the ladder be and still be safely positioned?

9. Name three things that increase comfort and decrease strain when working at a computer:
   1. 
   2. 
   3. 

10. What point is the cartoon on the first page trying to make?
QUIZ: Safety on the Job (ANSWER KEY)

1. What does “PPE” stand for and what are two examples of it?
   
   PPE stands for: **personal protective equipment**
   
   Examples of PPE are: *long pants; shirts with sleeves; adequate footwear; hard hats; safety glasses or goggles; earplugs, earmuffs, and gloves.*

2. What should a worker do if he or she thinks a task is unsafe?
   
   **Report it to the supervisor or foreman/forewoman.**

3. Name two things that should be done in a situation involving blood:
   
   **Any two of the following: avoid skin contact by using gloves; remove clothing with blood on it; wash affected areas thoroughly.**

4. Why is it potentially dangerous to block aisles, traffic lanes, fire exits, or gangways?
   
   **People could trip and fall; it could be a fire hazard; it could slow people down as they do their jobs; it could get in the way of people and vehicles.**

5. Why does long hair need to be contained under a hat or hair net?
   
   **It could get caught in machines; it could prevent workers from seeing clearly; it could contaminate a sterile work environment; it could distract the worker.**

6. What is one acceptable way for a ladder to be supported at the bottom?
   
   **With rubber safety feet; with spikes; or with cleats nailed to the floor.**

7. If a ladder is 16’ (16 foot) tall, what is the required horizontal distance from the wall to the bottom of the ladder?
   
   **4 feet**

8. If there is a 7’ (7 foot) distance between the wall and the bottom of the ladder, how tall can the ladder be and still be safely positioned?
   
   **28 feet**

9. Name three things that increase comfort and decrease strain when working at a computer:
   
   **Positioning the monitor at or below eye level; moving your eyes instead of your head as you look at the screen; adjusting the chair so your forearms are horizontal; having your elbows at right angles; adjusting the monitor’s viewing preferences to avoid eyestrain.**

10. What point is the cartoon on the first page trying to make?
    
    **Safety procedures are important, and they have to be followed everywhere, by everyone. The person in the image is posting a sign about safety, but is doing it in a very unsafe way, on chairs that are very dangerously balanced.**
Now that students have been exposed to many careers and are developing preferences, they will begin to wonder, how can I work in this field? CUNY and SUNY offer dozens of certificate and degree programs in Manufacturing, both for entry-level careers and more advanced level careers. Students do not need to choose one immediately, but should become comfortable learning how to research them.

**ACTIVITIES IN THIS SERIES**

3.1 • Researching CUNY Degree and Certificate Programs in Manufacturing*

3.2 • Understanding CUNY Degree Program Requirements*

3.3 • SUNY Certificate: Precision Machining (Tooling) Certificate Program*

3.4 • How Do I Enroll in CUNY?*
Background on CUNY*

The City University of New York has campuses in all five New York City boroughs. It is comprised of 24 colleges in total, offering Associate’s, Bachelor’s, Master’s, Doctoral and Professional degrees, in addition to Certificate programs. Degree programs are offered through the college’s academic departments. Certificate programs are generally offered through the Continuing Education departments.

CUNY Community Colleges

CUNY’s community colleges, also known as 2-year colleges, include the Borough of Manhattan Community College, Bronx Community College, Guttman Community College, Hostos Community College, Kingsborough Community College, LaGuardia Community College and Queensborough Community College. These colleges offer Associate’s degrees and Certificates. Many adult education students enter degree programs through CUNY’s community colleges.

CUNY Senior Colleges

CUNY’s senior colleges include Baruch College, Brooklyn College, Queens College, York College, The City College of New York, Lehman College, Hunter College and John Jay College of Criminal Justice. All of these offer Bachelor’s degrees. Medgar Evers College, New York City College of Technology and the College of Staten Island offer Bachelor’s and Associate’s degrees.

Background on SUNY

SUNY is the largest public university system in the country. It includes 64 community colleges and universities and grants degrees at all levels. Operating all around New York State, 93% of New Yorkers live within 15 miles of a SUNY school.

Understanding Degrees vs. Certificates

Most CUNY colleges* offer both certificate and degree programs. Following are some of the main distinctions.

What Are Degrees and Certificates?

College degrees require several years of study and include coursework in a student’s major as well as foundational coursework in subjects like English,
Math and Science. Degree programs require that students have high school or equivalent diplomas, be accepted for admission to the college, and pass placement exams before enrolling in courses for credit. Most Associate’s degrees require 60-65 credits.

Certificate programs vary in their requirements and details. Some are credit-bearing, while others are not. Most require a high school or equivalent diploma, but some do not. Some certificate credits earned may transfer into a degree program if students decide to pursue a degree at a later date. Some lead to licensure, which may have requirements of its own, such as legal residency.

**HOW CAN I PAY FOR DEGREES AND CERTIFICATES?**

The tuition for degree programs is a flat rate for full-time students, those who take 12 or more credits per semester. Part-time students, those who take fewer than 12 credits per semester, are charged a rate per credit hour. Students who receive Financial Aid from the federal and/or state governments can use these grants toward tuition. Other sources of financial support for degree programs include loans and scholarships. CUNY also offers a payment plan allowing students to pay tuition in installments.

The college’s Financial Aid cannot be used for non-degree programs. Financial support for Certificate programs include other government grants, loans and scholarships. Public Assistance grants can be used toward many Certificate programs.

Some students who are not eligible for federal or state Financial Aid may be eligible for scholarships specifically intended for them, such as in the case of undocumented students.

**WHICH IS BETTER, DEGREE OR CERTIFICATE?**

Both are valid and useful forms of education. Students need to assess their own situations and career goals in order to decide which is right for them. They should consider:

- How much time they can devote to education, on a weekly basis and in total numbers of years.
- What kind of career they are interested in preparing for.
- How much money they can spend on education, including paying out of pocket, using payment plans, or financial aid if eligible. The college websites list tuition charges as well as information on applying for financial aid, scholarships and payment plans.
- If they are willing to take on the sometimes lengthy process of applying for scholarships, including writing personal essays.
- How much weight the credential (degree or certificate) carries in the labor market, in particular, if it is required or beneficial for the career they want to pursue.
Researching CUNY Degree and Certificate Programs in Manufacturing*

Students practice using a college website to locate degree and certificate programs in Manufacturing, then choose one degree program to research in further detail.

PREP

- Go to the New York City College of Technology (City Tech)* website, www.citytech.cuny.edu. Under the Academics tab near the top of the page, click on Degrees & Areas of Study from the drop-down menu. Click on the boxes that relate to Manufacturing, such as Engineering Technology, Applied Arts and Sciences, and Design and Media.
  
  Read the descriptions of the majors that lead to Manufacturing-related degrees, such as Design and Media: Industrial Design; Applied Arts and Sciences: Chemical Technology and Applied Chemistry, Engineering Technology: Mechanical Engineering Technology, and any others you think belong in the Manufacturing sector.

- In the left-hand bar, click on Continuing Education, then scroll down the page to familiarize yourself with the workforce programs related to Manufacturing, such as the Business and Industry Training Center and the Workforce Development Center. Click on Continuing Studies to learn about City Tech non-degree offerings related to Manufacturing, such as Welding, Digital Design, and Auto CAD (Computer Aided Design).

- Be prepared to discuss the terms: college major, college degree, certificates and credential. (See previous pages for definitions.)

- Write the URL for New York City College of Technology on the board:
  
  www.citytech.cuny.edu

VOCABULARY

- college major
- college degree
- certificates
- credential

MATERIALS

- This session requires use of a computer lab.

- Manufacturing Majors and Certificates at New York City College of Technology* worksheet

- Exploring a College Degree in Manufacturing worksheet
EXPLAIN

1. Colleges and universities generally offer a number of different programs that culminate in students earning certificates, Associate's degrees and Bachelor's degrees, among others. **What are the big differences between these programs?**
   - *Amount of time in program, cost, level of credential, depth of study, courses offered.*

2. **What is the difference between a college major and a college degree?**
   - *A major is the subject, program or area of study. A degree is the credential you earn when you complete the program (Bachelor's, Associate's, Master's, etc.)*

3. In many, though not all fields, a degree is considered a higher level credential than a certificate but many careers in Manufacturing do not require more than a certificate, so both are important to consider. Although you can get a job in Manufacturing without a degree or certificate, some jobs in the field do require one. Today you're going to explore the Manufacturing programs that New York City College of Technology* offers.

4. **Distribute Manufacturing Majors and Certificates at New York City College of Technology* worksheet.** Ask students to navigate to the college's website (written on the board), then click on **Degrees & Areas of Study**, then identify majors that they think belong to the Manufacturing sector and write them on the worksheet.

5. **Ask students to click on Continuing Education in the left-hand bar, then Continuing Studies Center,** then identify certificates that prepare students for careers in Manufacturing, and write them on the worksheet.

6. Discuss the experience of using the website. **Was it easy to navigate? Difficult?** What helped you find what you were looking for?

7. **When choosing a program, it’s important to find in-depth information about exactly what you will be studying.** We’re going to explore one degree program in depth: the Associate's degree in Applied Science (AAS) in Mechanical Engineering Technology. Ask students to navigate to the description of this degree. They should navigate back to **Academics**, then to **Degrees**, then **Engineering Technology**, then **Mechanical Engineering Technology**.

8. **Distribute Exploring a College Degree in Manufacturing worksheet.** Ask students to complete the worksheet based on the information in the description of the AAS in Mechanical Engineering Technology degree program.
Manufacturing Majors and Certificates at New York City College of Technology*

Use the college website to find majors and certificates in Manufacturing offered at the college. For college majors that lead to degrees, look under the Degrees and Areas of Study section of the website. For certificate programs, look in the Continuing Education Department.

College Website: http://www.citytech.cuny.edu

MAJORS LEADING TO DEGREES IN MANUFACTURING

1.
2.
3.
4.

Describe where on the college website you found this information:

CERTIFICATES IN MANUFACTURING

1.
2.
3.
4.

Describe where on the college website you found this information:
Exploring a College Degree in Manufacturing

Use the New York City College of Technology website (www.citytech.cuny.edu)* to read about the Mechanical Engineering Technology major, then paraphrase the information you find to complete the questions below. Make sure your answers are in your own words.

1. What is the name of the major?

2. What type of degree is it (Associate’s of Science, for example)?

3. Name four careers this degree prepares students for.
   1.
   2.
   3.
   4.

4. How many credits can you earn in this program?

5. Which academic department is this major a part of?

6. Is there an internship, placement, or practice portion of this program? Explain.

7. Write about one part of the program that sounds interesting to you and explain why.
   Write about one part that sounds like it might be challenging for you and explain why.
Understanding CUNY Degree Program Requirements*

Students read a description of a sample Manufacturing major and identify the roles of various general education requirements within the overall course of study. Requirements of majors at other colleges may be organized differently from those at CUNY*.

PREP

- Researching college degrees involves learning about which courses are required of which majors. Every major has course requirements. Some requirements specify a particular course; other requirements allow students to choose from several related courses. Most students are required to take two semesters of English composition. Other requirements may include Math, Science, Humanities, Social Sciences, Foreign Languages and/or Arts courses. Sometimes students have difficulty understanding the relevance of general education requirements to their major.

- Requirements for majors are divided into two main areas—Curriculum Requirements, which are the courses that relate directly to the major; and General Education requirements, which are divided into two parts: Required Core and Flexible Core requirements. Course requirements of the major are usually outlined in the description of the major in the Academics section of the college website. See the description of the Mechanical Engineering Technology major at New York City College of Technology on the next page as an example.

- Read the Mechanical Engineering Technology description, including both the Overview and Degree Requirements on the New York City College of Technology website. In the Degree Requirement section, read course descriptions linked to each course requirement. See the screenshot on the next page.

MATERIALS

- This session requires use of a computer lab.

- Understanding Degree Requirements worksheet
Section 3.2

EXPLAIN

1. Today we’re going to practice navigating a college website to learn how to identify the courses required for a given major. We’re going to use Mechanical Engineering Technology as a sample major. In the future, you will be able to research a major or certificate that you are interested in, using your skill in navigating college websites.

What do you think the Mechanical Engineering Technology major is all about?
>
   The major prepares students to work on the design and development of new products, using technologies such as systems simulations and CAD (computer aided design).

2. What courses do you think are required for this major?

3. Write www.citytech.cuny.edu on the board. Ask students to pair up with someone sitting close to them before navigating to the site. Circulate to ensure they are all on the correct page. Then ask them to click on Academics, then Degrees and Areas of Study, click the Engineering Technology box, then the Mechanical Engineering Technology box, then the A.A.S. in Mechanical Engineering Technology. Make sure they have navigated through each step before moving on to the next one.

4. Ask students to read the description of the major in the Overview tab and identify some of the tasks they think might be required of people who work in the field of Mechanical Engineering Technology. Write their responses on the board. They might say things like: design computers used in Manufacturing, use machines used in Manufacturing, or design ways of manufacturing products.

5. Explain that the major requirements come in two parts: curriculum requirements and general education requirements. General education requirements are further divided into core and flexible core requirements. Curriculum requirements are the courses that directly relate to the major or career. Core and flexible core requirements are courses that students in this and other majors take across a variety of departments, many of which prepare students for further study in their major area.

6. Ask each pair of students to click on the Degree Requirements tab and read the information listed. Each required course is linked to a description of the course. They will need to read the course descriptions to answer the questions on the worksheet.

7. Distribute the Understanding Degree Requirements worksheet and ask students to complete it with their partner using the course descriptions.
From http://www.citytech.cuny.edu/mechanical/mechanical-technology-aas.aspx
Understanding Degree Requirements*

Read the Mechanical Engineering Technology degree requirements on the City Tech website, www.citytech.cuny.edu.* For each course listed, click on the link to read the course descriptions, then reach your own conclusions about how each course is relevant to the Mechanical Engineering Technology major, then answer the questions below.

1. **English Composition**: How will the required English courses help Mechanical Engineering Technology professionals? *Read the course descriptions to answer this question.*

2. **Mathematical and Quantitative Reasoning**: Why do Mechanical Engineering Technology professionals need to use math? *Read the course descriptions to answer this question.*

3. **Life and Physical Sciences**: Why do you think these courses are required? *Read the course descriptions to answer this question.*
4. What do students do in MECH 2322 and why might it be a useful course for Mechanical Engineering Technology students?

5. How is MECH 1101 different from many of the other courses listed? Why is it required for Industrial Technology students?

6. Having learned about the Mechanical Engineering Technology major, is this a field you would consider pursuing? Why or why not?
SUNY Certificate: Precision Machining (Tooling) Certificate Program at Monroe Community College*

Students learn about certificate programs by reading a description of a Manufacturing certificate offered at SUNY Monroe Community College*, and developing questions based on what they read.

MATERIALS

- Monroe Community College Precision Machining (Tooling) Certificate Program* handout

EXPLAIN

1. Certificate programs can be credit-bearing or not, require one semester or many semesters of study, may be open to diploma-holders only or may be open to those who have not yet earned diplomas. There is a lot of variation in certificate programs. As the needs of industries change, colleges are adding and updating certificate programs all the time. The most up-to-date information can be found through the Continuing Education or Workforce offices of many campuses.

2. We are going to look at a certificate program offered at a SUNY college. After reading the certificate program descriptions, you will develop questions you have about the program.

3. Ask students to navigate to www.monroecc.edu.* Navigating to the Precision and Tooling certificate requires several steps. Be sure all students are keeping up, as you guide them through the following navigation:

   1. Under the About MCC drop-down menu, click on Workforce Development.
2. From the choices of 8 divisions near the bottom of the page, select **Career Technical Education**.

3. Then select **Applied Technologies**. Then **Precision Tooling and Machining**.

4. Finally, select **Precision Tooling**, from the list of highlighted programs. Ask students to click on the **Precision Tooling** certificate program and read the entire page, including the program description and required courses.

4. Ask students to work in pairs and write five questions they have about entering this program.

5. Ask students to share their questions with the class.
Precision Machining Certificate Program

Department: Applied Technologies
School(s): Applied Sciences and Technologies

Description:
This certificate program is designed to prepare graduates for employment in the precision metal-working industry in Monroe County and the Finger Lakes Region of New York State. Included in this certificate is the course work and hands-on skills development necessary to enter apprenticeship programs in mold making, machine building, tool and die making, or employment in production machining. Students enrolling in this program can also prepare for majors in the mechanical, quality, or manufacturing programs offered at Monroe Community College.

All TAM (Tooling and Machining) courses are approved as technical related instruction by the Bureau of Apprenticeship Training and used by the area’s local manufacturers as a means of educating current employees.

Program Learning Outcomes

1. Demonstrate necessary soft skills to acquire a job within a manufacturing industry.
2. Perform manual machine part production to industry standards.
3. Perform computer numerical machine part production to industry standards.
4. Demonstrate measurement techniques necessary for successful employment.
5. Compose machine tool programs necessary for successful employment.
6. Demonstrate written technical communication skills.
7. Apply mathematical skills to solve industrial problems.
8. Interpret engineering models for part production.
9. Follow standard safety practices used in industry.
### REQUIREMENTS FOR PROGRAM ENTRANCE

**Elementary Algebra with Geometry (or Math 098 at MCC)**

**DISTRIBUTION REQUIREMENTS**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FIRST SEMESTER: 15 Credit Hours</strong></td>
<td></td>
</tr>
<tr>
<td>TAM 101 Machine Shop Theory I</td>
<td>3</td>
</tr>
<tr>
<td>TAM 105 Machine Project Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>TAM 121 Mathematics for Machinists I</td>
<td>3</td>
</tr>
<tr>
<td>TAM 131 Machine Shop Print Reading I</td>
<td>3</td>
</tr>
<tr>
<td>TAM 141 Machine Shop Laboratory</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>15</strong></td>
</tr>
<tr>
<td><strong>SECOND SEMESTER: 17-18 Credit Hours</strong></td>
<td></td>
</tr>
<tr>
<td>ENG 101 College Composition OR ENG 200 Advanced Composition OR CRC 101 Practical Computer Literacy</td>
<td>3</td>
</tr>
<tr>
<td>TAM 123 Mathematics for Machinists II</td>
<td>3</td>
</tr>
<tr>
<td>TAM 132 Machine Shop Print Reading II</td>
<td>3</td>
</tr>
<tr>
<td>TAM 139 CNC Vertical Machine Tool Programming I</td>
<td>3</td>
</tr>
<tr>
<td>TAM 142 CNC Mill Setup OR TAM 143 CNC Lathe Setup</td>
<td>3</td>
</tr>
<tr>
<td>TAM 205 CNC Machine Project Laboratory OR TAM ELECTIVE</td>
<td>2-3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>17-18</strong></td>
</tr>
</tbody>
</table>

**TOTAL CREDITS 32-33**

**TAM ELECTIVES**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>TAM 115 Principles of Metallurgy</td>
<td>3</td>
</tr>
<tr>
<td>TAM 138 Dimensional Metrology</td>
<td>3</td>
</tr>
<tr>
<td>TAM 142 CNC Mill Setup</td>
<td>3</td>
</tr>
<tr>
<td>TAM 143 CNC Lathe Setup</td>
<td>3</td>
</tr>
<tr>
<td>TAM 151 Geometric Dimensioning and Tolerancing for Machinists</td>
<td>3</td>
</tr>
<tr>
<td>TAM 155 Tool and Fixture Design*</td>
<td>3</td>
</tr>
<tr>
<td>TAM 241 Advanced Machine Shop Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>TAM 242 Machine Shop Practice IV*</td>
<td>3</td>
</tr>
<tr>
<td>TAM 245 Computer Aided Manufacturing</td>
<td>3</td>
</tr>
<tr>
<td>TAM 246 Computer Aided Manufacturing 2</td>
<td>3</td>
</tr>
<tr>
<td>TAM 251 Statistical Process Control (SPC) for Machinists</td>
<td>3</td>
</tr>
<tr>
<td>TAM 255 Computer Aided Manufacturing Laboratory</td>
<td>3</td>
</tr>
</tbody>
</table>

*Additional Recommended Courses for Apprenticeship Training*
How Do I Enroll in CUNY?*

CERTIFICATES

CUNY certificate programs are administered through the colleges’ Continuing Education departments. Students should contact the college’s Continuing Education office to determine if there are any prerequisites, as well as the cost, schedule, location, deadlines and other pertinent information. Many programs require a high school diploma or equivalency as a prerequisite, but some, such as home health aide, do not.

In addition to the programs that CUNY offers, there are a range of low-cost or free short-term certificate programs in New York City offered at community-based organizations.

DEGREES

Once students have received a high school diploma or equivalent, they may apply to a CUNY college. They should research which college they want to attend, in order to find the best fit for their needs and interests. Once they are accepted, they will take placement exams in Reading, Writing and Math, which will determine whether they are placed into credit or developmental (remedial) courses. Students who need remediation should consider enrolling in CUNY Start or CLIP to improve basic skills at a low cost.

STEP 1: Research programs and colleges

There are many factors to consider when researching a college program, such as:

- Does it offer the major I am interested in?
- Where is the college located and how will I get there?
- Can I afford the tuition, either through payment, financial aid or scholarships?
- Are classes offered at times that work for me?
- How much time will I need to devote to attending classes, commuting and class preparation, including reading, completing assignments, group projects, and preparing for exams?

STEP 2: (May be concurrent with Step 1) Earn high school or equivalent diploma.

STEP 3: Apply to CUNY through the college’s Admission Office, known as Direct Admit, or online through the college website. CUNY does not ask students about their legal residency status.
STEP 4: Apply for Financial Aid—Pell, the federal grant, and TAP, the New York State grant, through the website, www.fafsa.gov

STEP 5: Once accepted, take CUNY placement exams in Reading, Writing and Math.

STEP 6: If remediation is required, enroll in CLIP or CUNY Start.

The CUNY Language Immersion Program is for students who are non-native English speakers and need to improve their reading and writing in English before enrolling in credit-bearing college courses.

CUNY Start is for fluent English speakers who need to improve reading, writing or math skills before enrolling in credit-bearing courses.

STEP 7: Attend New Student Orientations.
**Special Programs**

Beginning college can be overwhelming to many new students. The following CUNY programs provide students with smaller settings and more individual attention, academic support, such as instructional immersion and tutoring, financial support, such as contributing to tuition, travel expenses and book costs, and personal and academic advisement.

**LOW COST PROGRAMS FOR STUDENTS WITH REMEDIAL NEEDS**

**CLIP (CUNY Language Immersion Program)—**An intensive English as a Second Language (ESL) program for CUNY students who need to improve their academic English language skills. Classes meet five hours a day, five days a week, in day or evening sessions in all five boroughs.

**CUNY Start—**Provides intensive preparation in academic reading, writing, math, and advisement. An academic program with social supports, CUNY Start helps students prepare for college level courses and re-take placement exams in Reading, Writing and Math.

**FINANCIAL AND ACADEMIC SUPPORTS FOR DEGREE STUDENTS**

**ASAP (Accelerated Studies in Associate’s Programs)—**Helps associate degree students earn their degrees as quickly as possible, ideally within three years. ASAP includes a consolidated block schedule, cohorts by major, small class size, and requires full-time study. It also includes tuition waivers for financial aid-eligible students, textbook assistance, and monthly MetroCards.

**College Discovery—**Available to financially eligible students, College Discovery offers a pre-college summer program, tutoring, counseling and advisement, tuition assistance, book and materials stipends.

The above programs are university-wide programs. Individual CUNY colleges offer additional programs. Representatives are often available to present on panels or to classes.
Advancing in Manufacturing: Engineering Careers

While it is possible to begin working in the Manufacturing sector with no more than a high school or equivalency diploma, it is also possible to move into high level positions which require Bachelor’s degrees. Students read entries in a career database, practice paraphrasing, make inferences and present on an assigned career.

PREP

- Explore the Career Cruising website, www.careercruising.com. Career Cruising is a subscription-based service that many programs subscribe to. Find out if yours does, and use your program’s username and password to log in. Using the search bar at the top of the page, read the entries for Industrial Engineer, Mechanical Engineer, Materials Engineer, Chemical Engineer and Aerospace Engineer, and complete the Teacher’s Version: Careers in Engineering worksheet.

  If your program does not have a Career Cruising subscription, use the Bureau of Labor Statistic’s Occupational Outlook Handbook instead found at www.bls.gov. The above Engineering careers are described on both sites.

- A computer lab is necessary for this class. If not available, print the career descriptions from Career Cruising or BLS for use with students.

- Write www.careercruising.com or www.bls.gov on the board, depending on which website you will use.

MATERIALS

- Careers in Engineering handout
- Teacher’s Version: Careers in Engineer worksheet

EXPLAIN

1 Manufacturing is a sector that does not require a degree in order to get a stable, entry-level job with benefits and opportunities for advancement. However, the more education you have, the higher you can go in this sector, and the more money you can earn. After working in entry-level positions, some Manufacturing workers decide to pursue college degrees in order to advance in the field. Today we’re going to learn about mid-level to high-level careers in Engineering. These careers in Manufacturing require several years of experience and college degrees.
We are going to use a database called Career Cruising (or the Occupational Outlook Handbook) to research careers in Engineering and paraphrase the information we read. Then you will present the career to the class.

Distribute the Careers in Engineering handout. Ask students to read the title and ask:

**What is an engineer?**

*Someone involved in the planning, production or construction of things.*

When you think of an engineer, what comes to mind? What do they do at work? What do they help produce or build? What tools or instruments do they use?

*They use math and science to plan the building of bridges, roads, office buildings, chemicals and electrical systems.*

Divide the class into five groups. Assign each group one of the Engineering careers—Industrial, Mechanical, Materials, Chemical and Aerospace. In their group, students should take 2 minutes to discuss what they think their assigned Engineer does at work. Encourage them to guess and freely discuss their ideas without censoring themselves. They will learn more about this career momentarily.

Have all students navigate to Career Cruising and sign in (or BLS). Explain that there are many ways to use the website. It is designed for people looking for detailed information about a field they want to pursue, as well as for people who are not sure yet what field they want to pursue.

Next have all students enter “civil engineer” in the search bar at the top of the page. This is not one of the careers they will research together in their group. Instead, the whole class will look at this career description to learn the features of the webpage.

**Ask students what they see on this page.**

*At a Glance, with photos and general descriptions of the career.*

**What kind of information is presented here?**

*It’s an overview of the career, including photos of engineers at work, a salary range, required levels of education and videos.*

**What do you see in the left-hand bar?**

*Job Description, Working Conditions, Earning, Education, etc.*

**What do you think you will find there?**

*More detailed information about each of those topics, concerning the Civil Engineering career.*
Distribute the *Careers in Engineering* worksheet.

Don’t write anything yet. Read the handout, then consider:

If you were going to complete the worksheet for Civil Engineering, where on the website would you find the information you need?

▶ *Job Description, Working Conditions, Earnings, Education.*

Read these descriptions with a partner and develop a 5-sentence description of the Civil Engineering career that you will share with the class.

5 Have a few pairs share their descriptions.

6 Now you are going to read about your assigned Engineering career, and complete the worksheet by paraphrasing the information you find.

*Note to teacher:* Review paraphrasing as needed.

7 Now you will prepare to present your research to the class. Write the following questions on the board and discuss them as a class. Students should work in their groups to make 5-minute presentations on the Engineering career they researched.

- **What makes an effective presentation?**
  - It’s well organized, with clear logic from one point to the next, clear, loud speaking, personal connection to audience.
- **In what order will you present the information?**
- **How will you introduce the topic?**
- **What questions do you anticipate? Can you answer those questions, or do you need to research the answers?**
- **Is all of your information paraphrased?**

*Also include:*

- What personal characteristics are a good match for someone who wants to enter this field?

8 Each group presents their research. Students in other groups should jot down questions they have about the career as they are listening. At the end of each presentation, the class should be given an opportunity to ask their questions to the presenters.

9 **Optional:** Students can critique one another’s presentations, offering feedback on what made certain parts especially effective, and suggestions for improvement. They learn about professional or academic critiques, their goals, how to offer critique, and how to receive critique—an important workplace and college skill.
ASK

What is a critique?

- Offering feedback on a project. A critique can include praise as well as suggestions, for example, it can identify which parts were particularly effective and which parts need improvements.

Who does them?

- Many college students and workers do them. Many architecture and design students are required to do them, but other students do them too, when they ask their classmates to read their work and offer suggestions.

Why is critiquing done?

- To get better! When you’ve made something the best you think it can be, it’s helpful to hear how others have experienced it, and what ideas they have for improving it. Even the most famous and accomplished writers have editors. These are people who offer feedback in order to help the writer improve.

Write the following sentence stems for critique/feedback on board.

**OFFERING FEEDBACK:**
- “I thought it was effective when you said…”
- “You really caught/held my attention when you…”
- “I was confused when you said…”
- “I wanted to hear more about…”
- “One suggestion I have is…”

Then invite students to critique each presentation. Ask first for the presenters to critique themselves. They should say one part of the presentation they thought was particularly effective, and one aspect of the presentation that can be improved, and how. Next, two students in the audience can critique the presentation using the same format—one piece of positive feedback and one suggestion for improvement.
Teacher's Version: **Careers in Engineering**

**FOR THE TEACHER:** Complete this key based on Career Cruising profiles in order to support students in their research.

<table>
<thead>
<tr>
<th>POSITION</th>
<th>What they do at work (Duties)</th>
<th>Why a business needs them (Context)</th>
<th>How to become one (Education)</th>
<th>How much they can earn (Salary)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial Engineer</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mechanical Engineer</td>
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<tr>
<td>Materials Engineer</td>
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<tr>
<td>Chemical Engineer</td>
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<tr>
<td>Aerospace Engineer</td>
<td></td>
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</tbody>
</table>
# Careers in Engineering

In your group, complete the chart below, discussing and paraphrasing the information you read about on the website.

**Type of Engineer:**

<table>
<thead>
<tr>
<th>What they do at work (Duties)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Why a business needs them (Context)</td>
<td></td>
</tr>
<tr>
<td>How to become one (Education)</td>
<td></td>
</tr>
<tr>
<td>How much they can earn (Salary)</td>
<td></td>
</tr>
<tr>
<td>Something that seems interesting about this career</td>
<td></td>
</tr>
<tr>
<td>Something that seems challenging about this career</td>
<td></td>
</tr>
<tr>
<td>Two questions I have about this career</td>
<td></td>
</tr>
</tbody>
</table>
Parents can only give good advice or put [children] on the right paths, but the final forming of a person’s character lies in their own hands.

—Anne Frank, Writer

ANNE FRANK (1929-1945), a young Jewish girl, and her parents and older sister moved to the Netherlands from Germany after Adolf Hitler and the Nazis came to power there in 1933. In 1942, Frank and her family went into hiding in a secret apartment behind her father’s business in German-occupied Amsterdam. The Franks were discovered in 1944 and sent to concentration camps; only Anne’s father survived. Anne Frank’s diary of her family’s time in hiding, first published in 1947, has been translated into almost 70 languages and is one of the most widely read accounts of the Holocaust.