

**CLASSROOM ACTIVITY 3**

## **Kid-start a Small Business**

# How can advanced manufacturing processes help me start a small business?

### **Key Learning Topics**

- Industrial engineering
- Technology
- Advanced manufacturing

### **Overview**

Young adults are preparing for the workforce by bringing homemade items to consumers—everything from bath bombs to slime to tie-dye clothing. But as their businesses grow, they find themselves not being able to meet demand. In this activity, students investigate how different products can be made more efficiently with the help of advanced manufacturing equipment and streamlined processes. Students will then propose solutions to real-world problems inspired by advanced manufacturing equipment and the engineering process to help small business owners meet their demand. They will also explore careers related to industrial engineering and manufacturing.

### **Key Learning Topics**

- Industrial engineering
- Technology
- Advanced manufacturing

### **Target Audience**

Grades 5–9 // Engineering, Science

### **Activity Duration**

One 45–60 minute class period

### **Essential Question**

How do advanced manufacturing techniques (innovative technologies like augmented reality, 3-D printing, robotics, and computer programs) help small businesses scale?

## Materials

- Computers with access to the internet
- **Scaling Up** student activity prompt
- **Scaling Up** teacher prompt
- Timer
- Blackboard or whiteboard

## Background Information/Links

3D printers and robots used to be ideas in science fiction. Today, these tools are essential in manufacturing the products we use every day. For instance, did you know that 3D printing technology is used to make implants for joints?<sup>1</sup>

According to the U.S. Bureau of Labor Statistics, the demand for industrial engineers is expected to grow by 8% from 2018 to 2028—a rate that is faster than the national average.<sup>2</sup> These workers devise efficient systems that help make products more effectively. By gaining exposure to advanced manufacturing techniques and career paths in engineering and entrepreneurship, students will gain insight into a wide array of STEM professional pathways.

## Teachers' Note

This activity can be modified for virtual learning by taking the following steps:

1. If technology allows, use the chat function to collect student responses during the engage activity at the beginning of the exercise.
2. Instead of having students pair off in the engage activity, have each student take a few minutes to individually write his or her product idea.
3. If technology allows, use the breakout groups function to divide students into the four career groups.

## Procedure

Introduction—10 Minutes

- Ask students if they can think of a global brand that started out as a small business. Some examples include Ben & Jerry's Ice Cream, Starbucks, Amazon, Microsoft, and Apple. Solicit a few responses from students and share the above examples if they are not provided by students.
- Share the following origin stories of these popular companies:
  - Nike was started when a track and field coach made shoe soles on a waffle iron
  - Apple's first computers were built in a garage
  - The popular restaurant chain Shake Shack started out as a hot dog cart

<sup>1</sup> <https://www.fda.gov/medical-devices/3d-printing-medical-devices/medical-applications-3d-printing>

<sup>2</sup> <https://www.bls.gov/ooh/architecture-and-engineering/industrial-engineers.htm>

- Ask students to think about some similarities between the companies and products that came to mind. Answers might include that they started off small and grew larger over time, that they started off making products in their homes and moved to larger facilities, etc.
- Divide students into pairs. Ask each pair to spend two minutes coming up with a creative idea for a new product. Provide 2–3 minutes for student pairs to share their ideas with the class.
- Explain that many of the business ideas presented by the class would need support from advanced manufacturing technologies in order to grow. Define advanced manufacturing technologies as ways of making products that utilize automation, software and other forms of computation and networking.<sup>3</sup> Robotics and 3-D printing are examples of advanced manufacturing techniques.

### Classroom Activity | 30 Minutes

- Divide the class into four groups.
- Assign each group one of the following manufacturing specialties:
  - Textiles/clothing
  - Computers/electronics
  - Food processing and packaging
  - Product manufacturing (wood, metal, plastic, etc.)
- Write each group's name on the board.
- Provide each group with 10 minutes to research their specialty and complete the **Scaling Up** student capture sheet.
- Once student groups have researched their specialty, ask for one volunteer from each expert group to come to the front of the class. These four students are going to be the judges for the activity. Have the judges sit at the front of the class.
- Inform the groups that they are now contestants on a gameshow called "Scale Up." A variety of small businesses will submit product ideas to the game show. For each product, the four expert groups each pitch a plan for how they'll use an advanced manufacturing technique from their area of specialty to help the business scale up. After each group makes their pitch, the judges will decide the winner for that product. The group that wins the most products wins the game. Keep a tally on the board of which group wins each round.
- Explain that you will serve as the game show host and read the business ideas. After each idea is shared, groups will have 30 seconds to deliberate. After 30 seconds is up, have each group share their "pitch" to the entrepreneur for which manufacturing techniques they would use to help the business scale up. After all of the groups have pitched their solutions, the judges will deliberate and select the winning group.
- Repeat through the ten pitch ideas on the **Starting Up** teacher prompt sheet.
- Once all the prompts have been read, tally up the scores and announce the winning group.

<sup>3</sup> <https://www.manufacturing.gov/glossary/advanced-manufacturing>

### Lesson Summary | 5 Minutes

- Conclude the lesson by asking students the following summarizing questions:
- What advanced manufacturing techniques did you learn about today?
- What are some career paths in manufacturing? What skills are needed for these jobs?
- Think back to the product idea you discussed with your partner at the beginning of the lesson. What advanced techniques would you use to scale your product idea?

## National Standards

### Next Generation Science Standards (NGSS)

- [MS-ETS1-2](#): Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
- [MS-ETS1-3](#): Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

### International Society for Technology in Education (ISTE) Standards

- **3a**: Students plan and employ effective research strategies to locate information and other resources for their intellectual or creative pursuits.
- **5d**: Students understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions.

### Common Core Standards for ELA

- [WHST.6-8.7](#): Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-ESS3-3)
- [WHST.6-8.8](#): Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. (MS-ESS3-3)

## Scaling Up: Teacher Prompt

Read the following ten small business product ideas during the “Starting Up” activity:

1. This inventor wants to create a phone case that is bacteria resistant.
2. This inventor wants to create a device that makes your bed for you in the morning.
3. This inventor wants to create a dog bowl that keeps refrigerated food fresh.
4. This inventor wants to create a blanket that adjusts its weight according to the temperature.
5. This inventor wants to create an adapter that makes seatbelts more comfortable for young children.
6. This inventor wants to create a waterproof lining that you can zip on and off of trail running sneakers.
7. This inventor wants to create a location device that helps you find your wireless headphones.
8. This inventor wants to create a new type of ice cream that melts more slowly than traditional ice cream.
9. This inventor wants to design an office chair that encourages good posture by notifying the user when they slouch.
10. This inventor wants to design a sweatshirt that compresses down into the size of a pair of socks to make it easy to pack.

