



How We Make Things



Look around you. Almost everything we use each day—our clothes, shoes, books, and furniture—are all manufactured. How we make things has changed greatly over time. Digital innovation is making machines smaller, faster, and smarter. Innovation, however, isn't new. People have been inventing, creating, and building throughout history.

In Unit 3, we will learn about exciting ways people around the world are making new products, from 3D printing to makerspaces. You will explore how to create new products to help others, and have the opportunity to create a product to improve your school.



Unit 3 Vocabulary

DATA (noun)

Information collected by people or computers. *Example: The researchers interviewed people to collect data about community health.*

INNOVATION (noun)

An improvement to something that already exists; a new product, idea, or way of doing something. *Example: The self-driving car is a recent innovation.*

MANUFACTURE (verb)

To make things, either by hand or by machine. *Example: The factory manufactures thousands of pencils each day.*

PRODUCT (noun)

Something that is made and sold. *Example: The store sold many sports products like footballs and running shoes.*

PROTOTYPE (noun)

The first model of a product created as an example of what the final product will be. *Example: The inventor made a prototype of a robot out of cardboard before building the final product out of plastic.*

SURVEY (verb)

To ask questions in order to learn what people think. *Example: The students surveyed their classmates about their favorite foods.*



Vocabulary Challenge: Where's My Partner?

Match each vocabulary word with the word that has a similar meaning.

- | | |
|----------------|-------------|
| 1. Manufacture | Information |
| 2. Survey | Example |
| 3. Prototype | Make |
| 4. Innovation | Ask |
| 5. Data | Improvement |



1 My City Makes

When you think of your city or country, what products come to mind—food, handicrafts, clothing, electronic devices, or something else? Every city manufactures products, but the way these things are made has changed over time. Things that were once made by hand are now often produced in factories, sometimes by people and robots working together.



Identify a product that is made in your city or country. Brainstorm with your class or research online to find out how the product is made today, and what technology was used to make it in the past.

A product that is made in my city or country is:

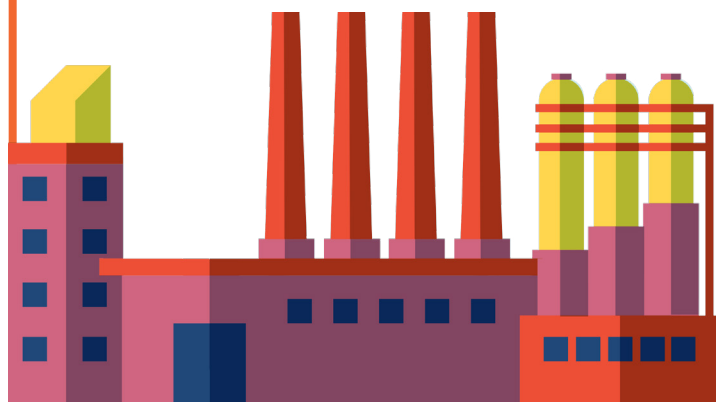
Past

Technology that made this product in the past:



Present

Technology that makes this product today:



Where did you find your information?
Write down your sources:



Global Discussion: My City Makes

Share a unique product from your city in the **My City Makes** discussion. Include a photograph of the product. Remember to write a photo credit!

Hello everyone!

My city makes

This product represents my city because

One way technology has changed how it is made is

Your friend,



Read and Reply

What new products did you learn about by reading posts in the **My City Makes** discussion? Choose one interesting post from an international peer and reply with comments and questions.

Dear ,

I thought your product was interesting because

One connection I made to a product in my city is

Your friend,



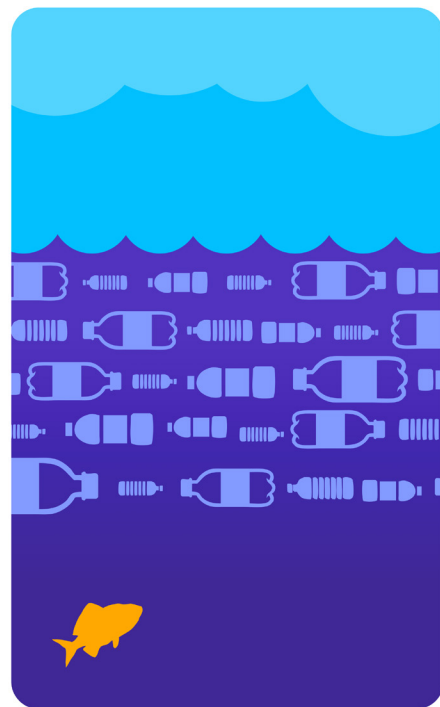
Did you know?

Today, plastic is used in common household items. But did you know that it was once considered a life-saving innovation in the medical field? The use of disposable plastic gloves and needles has stopped the spread of disease and saved many people's lives.

However, plastics do not decompose, or break down, for thousands of years. Every piece of plastic ever created, unless it was recycled, still exists.

To help with this problem, compostable plastics are being developed using plant starch called cellulose. These bioplastics are broken down by microbes, or small living things, in the soil in as little as a few months to several years.

A Brief History of Plastics, Natural and Synthetic, BBC News Magazine, May 2014



Career Spotlight: Inventor

Inventors create new products by sharing ideas and working together, just like you and your classmates. Inventors collaborate with people from many different backgrounds, ages, and interests. For example, artists and engineers might work together, or biologists and musicians. Writers and computer programmers make good teams, too. It's important to listen to diverse perspectives.

Sometimes inventors collect data to find out what people need. They make a plan, create a prototype, and test their new invention. They try new ideas and aren't afraid to make mistakes. After all, mistakes show them what improvements they need to make.

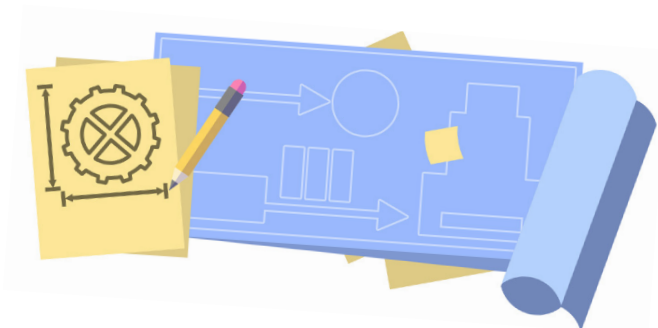


2 Innovation Station

At the end of this unit, you will be creating a new product to help your school. It can be an innovation to improve a product that already exists, or something completely new. This week it's time to get inspired.



Go to the ***Innovation Station*** e-classroom page to watch videos and stories about exciting inventions, some of them by young people. After you watch the videos, answer the questions below with your class.



Name of product

Who does it help?

What technology and materials are used to make it?

Blank yellow box for product name.

Blank yellow box for who it helps.

Blank yellow box for technology and materials.



Global Discussion: Innovation Station

Which story on the **Innovation Station** page in the e-classroom inspired you? Write a post to share your ideas. Maybe your ideas will inspire others, too!

Hi everyone,

My favorite invention was

because

Something I might like to create is

It would help people to

Your friend,



Read and Reply

Choose one international post in the **Innovation Station** discussion. Reply with feedback and share ideas.

Hello

I think your idea for a new invention is great because

One idea I want to share with you is

Your friend,



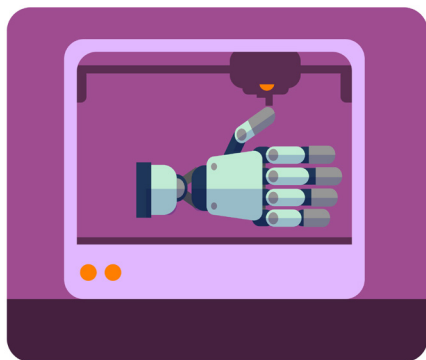
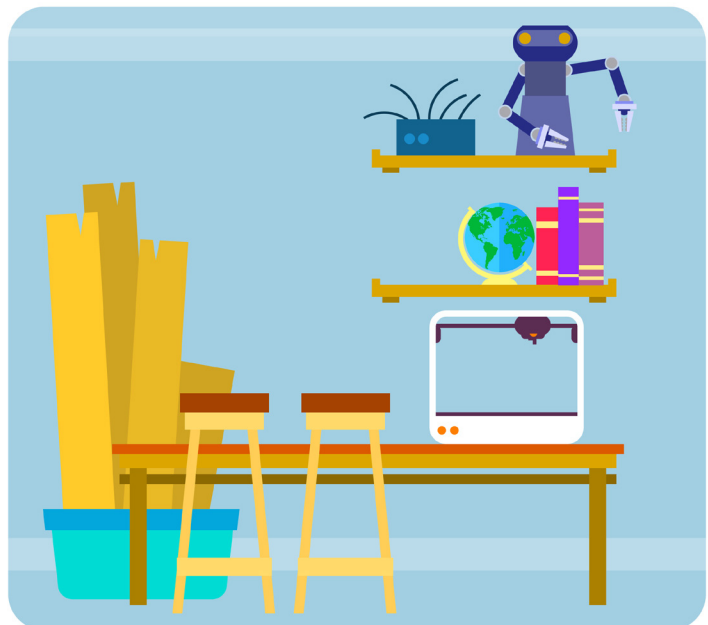
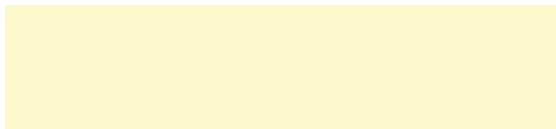
Learn More: The Maker Movement

The maker movement started in 2005 with the launch of MAKE Magazine. MAKE teaches people how to make everything from electronics to decorations. Since then, the movement has grown. Today there are more than 1,300 active or planned makerspaces around the globe where people come together to collaborate, experiment, invent, and create. Makers might find creative ways to repurpose old or broken electronics to make new things, or reuse plastics and metals to keep them from being thrown away.

Makerspace

Makerspaces are workshops where people can go to create. There are tools like 3D printers, laser cutters, wood-working tools, electrical tools, and anything else people need to make things. There are hundreds of makerspaces around the world, and even some for young people. Check online for a makerspace near you!

A makerspace near me:



3D printing

A three-dimensional, or 3D, printer uses a thin ribbon of plastic or other 3D material instead of ink. It melts the material and slowly pours it in layers, one on top of the other, to create a 3D model. These types of printers have been used to create artificial hands, sculptures, jewelry, cars, and more.



3 Data, Data!

Data is just another word for *information*. Inventors collect data to help them decide what type of product would be most useful to create. Data can be collected in many ways—with a survey, a poll, or a census. Questions can be asked in person, on paper, or online. Have you ever participated in a survey or a poll?



School Survey

This week, conduct a survey to collect information from students and adults at your school. The information you collect will help you decide what product will be the most helpful to invent for your school.

Use the **My School Survey** worksheet on **page 48** to guide you.



Draw Conclusions

When you finish conducting your survey, read your results. Which answer was the most popular?

[Blank yellow area for writing conclusions]

Which of the ideas that were suggested would be possible?

[Blank yellow area for writing conclusions]



My School Survey

1. Ask people at your school the questions below. Add some questions of your own.
2. Say: "Hi, I am conducting a survey to create a new product for our school. Your answers will help us decide what product to invent. Would you like to answer some questions to help us?"
3. In the columns, write the answers you receive from each person. Add more columns if you need to. The more people you ask, the better your information will be.

Questions	Person 1	Person 2	Person 3
What area of our school would you like to improve?			
What is one thing that we could create that would improve this area?			



Global Discussion: School Survey

What did you learn from the data you collected at your school? Discuss your answers as a group, then have a group representative write a post in the **School Survey** discussion.

Hi everyone,

We discovered that most people at our school want to improve

[Yellow text box]

From our survey results, we also discovered that

[Yellow text box]

What did you find out at your school?

Your friends, [Yellow text box]



Read and Reply

It's time to read the posts from your international peers. Discuss the posts you read with your class or in small groups. With your group, write a reply in the **School Survey** discussion.

Dear [Yellow text box],

It is very interesting that

[Yellow text box]

One question we have about your survey is

[Yellow text box]

Your friends, [Yellow text box]



Learn More: Big Data



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People, governments, and businesses create and collect data every day. Photos, texts, emails, and all the pages on the internet are data. Companies, websites, and apps, even game apps, all collect data about the people who use them. They track where you click and what you buy. They analyze this information to create new products and websites, or to create advertisements. All this data adds up! Data has gotten so big that it's called *Big Data*. In 2010, there were 1.2 zettabytes of data in the world. That's the same volume as the Great Wall of China! So where does all this information get stored? That's where the **cloud** comes in.



Where is the cloud?

The computing cloud does not float in the sky. It exists on the ground, in giant warehouses around the world called data centers. Information is kept in rows and rows of servers, which are the memory boards of computers. When you search for information online, it travels from a server in a warehouse to your computer, just like a book pulled from a giant library.

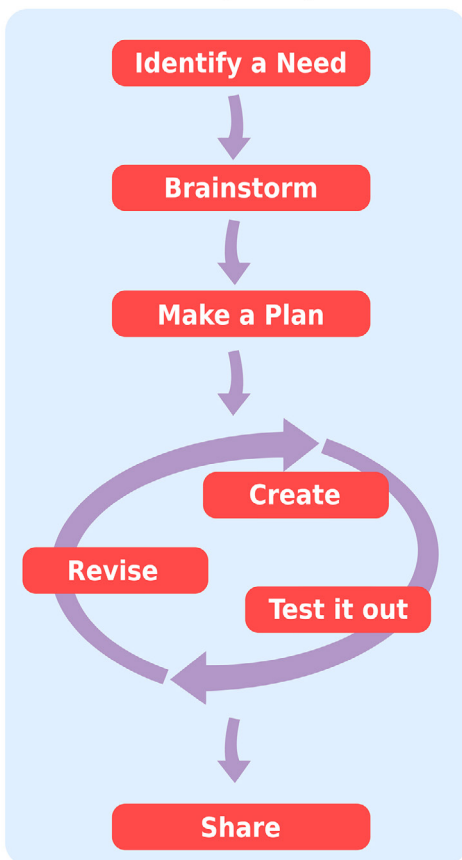


4 Digital Project: A Product for My School



You've learned about some exciting ways students and adults are creating new products around the world. Now it's your turn to get creative! If you could invent a new product to improve your school, what would it be? Work with a small group of classmates to develop a new product.

Design Map



1 Identify a Need

Think about the survey you just finished at your school. What do most students want to improve?



2 Brainstorm

What will your product look like? What will it do? Sketch and write all of your ideas. Watch the **How to Sketch** video on this week's e-classroom page for tips.



Make a Plan

It's time to make some important decisions about your project. The questions below will help you.

1. What product will you create?

[Yellow text box for answer 1]

2. Where will this product be used?

[Yellow text box for answer 2]

3. Why does your school need this product? How will it help people?

[Yellow text box for answer 3]

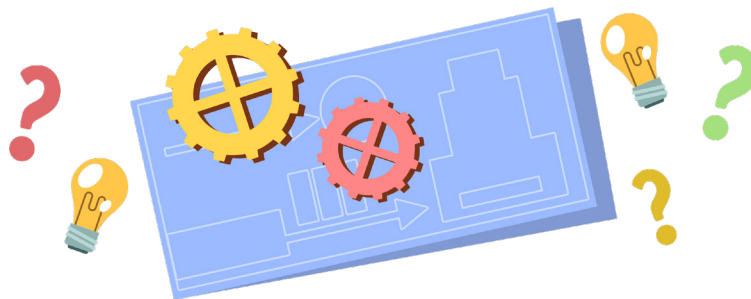
4. How will you create your project?

A prototype

A digital 3D model

5. If you are making a prototype, what materials do you need? If you are creating a digital model, what application will you use?

[Yellow text box for answer 5]



Create!

Gather your team together. If you are making a prototype, collect your materials. Remember to take pictures of your work at different steps to show how you made your product. This step takes the most time, but it can be the most fun.



5

Digital Project: A Product for My School

Now that you've created your prototype, work with your classmates to test if it works and make improvements. Then go to the **Unit 3: A Product for My School** discussion to share your work and see what others have invented around the world.

5

Test It Out

Try your invention. Does it work?

- Does it solve the problem?
- Is it easy to use?
- How could it be better?

6

Revise

Just like other inventors, use what you learned in the testing phase to make changes to your product.

- Change what doesn't work.
- Test it out again.

7

Share

Well done! You have invented a new product to help others at your school. Share your innovation with students at your school. Post pictures of your project or attach the file of your digital 3D model in the **Unit 3: A Product for My School** discussion.





Unit 3 Project: A Product for My School

Share your project in this week's discussion. Write a short explanation of your work. Attach pictures of your prototype or upload your digital 3D model.

Hi everyone,

We created a

This product is useful at our school because

We created it with

Could you use this invention at your school? What do you think?

Your friend,



Give feedback

View the products created by students in other cities. Choose two products you find interesting and write a response to give feedback.

Hello ,

Your product seems useful because

I wonder why

I would like to suggest that

Thanks,



Unit 3 Reflection

1. What topic did you find the most interesting in Unit 3?

Blank yellow response area for question 1.

2. What was the most challenging part of creating your product?

Blank yellow response area for question 2.

3. What were your favorite products from around the world?

Blank yellow response area for question 3.

4. Which product would be useful in your city? Why?

Blank yellow response area for question 4.

