

UNIT 3 OVERVIEW

How We Make Things

Unit 3 investigates the role of technology in how things are made, how production has changed over time, and how innovation happens. Students touch on topics meant to inspire exploration and personal curiosity, such as the maker movement, makerspaces, and Big Data. For their final project, students collaborate in groups to invent a new product for their school, which they will present as a prototype or digital 3D model.

TIME FRAME

Five weeks
January 3-February 24, 2017

VOCABULARY Data, innovation, manufacture, product, prototype, survey

CAREER SPOTLIGHT Innovator

ESSENTIAL ACTIVITIES

Week 1	<ul style="list-style-type: none"> • What My City Makes research activity • Global discussion and reply: My City Makes
Week 2	<ul style="list-style-type: none"> • Analyze innovative projects in Innovation Station • Global discussion and reply: Innovation Station
Week 3	<ul style="list-style-type: none"> • School Survey: Students conduct a survey to gather ideas for a new product for their school • Global discussion and reply: School Survey
Week 4	<ul style="list-style-type: none"> • Digital Project: A Product for My School • Identify a need, Brainstorm, Make a Plan, Create Your Product
Week 5	<ul style="list-style-type: none"> • Digital Project: A Product for My School • Test It Out, Revise, Share, and Give Feedback

MATERIALS

- ✓ Week 1: Unit 3 student workbook
- ✓ Week 2: Innovation videos in the e-classroom **Innovation Station** page
- ✓ Week 3: School survey template in the e-classroom **Student Survey** page
- ✓ Weeks 4-5: EITHER Recycled materials for making prototype of student product, OR a digital tool, such as TinkerCad (www.tinkercad.com) or SketchUp (www.sketchup.com), for drawing a 3D model of their product.

CURRICULUM CONNECTIONS

The following are optional ways to connect Global Scholars to curriculum areas.

History

- Compare manufacturing methods and technology in the past and present.
- Research the history of a product as it relates to historical and political events.
- Read and discuss the story behind famous inventions, and the teams of people that influenced and inspired their creation.

Business and Economics

- Investigate global supply chains.

Mathematics

- Create graphs to organize data that is collected during the School Survey activity in week 3.

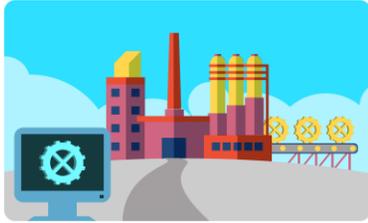
WEEK 1: My City Makes

Students will

- Research the products made in their city or country.
- Explore how one local product was made in the past, and how it is made in the present.
- Analyze how the product they have selected represents their city or country.
- Gain an understanding of regional products around the world.

Preparation

- ✓ Download the Unit 3 student workbook, one per student, to print, save, or distribute electronically on computers, flash drives, or cloud-based systems such as Google Drive or Dropbox.
- ✓ Preview the resources in the **Unit 3** page in the **Teachers' Lounge**. Use the videos and articles during lessons to spark students' interest and curiosity.



Unit Introduction: How We Make Things

Students are asked to think critically about the products around them, to imagine how technology has influenced the way they are made, and how this impacts the environment.

Workbook pages 39-40

Vocabulary: Innovation, manufacture, product

Time: 15 minutes

Explain

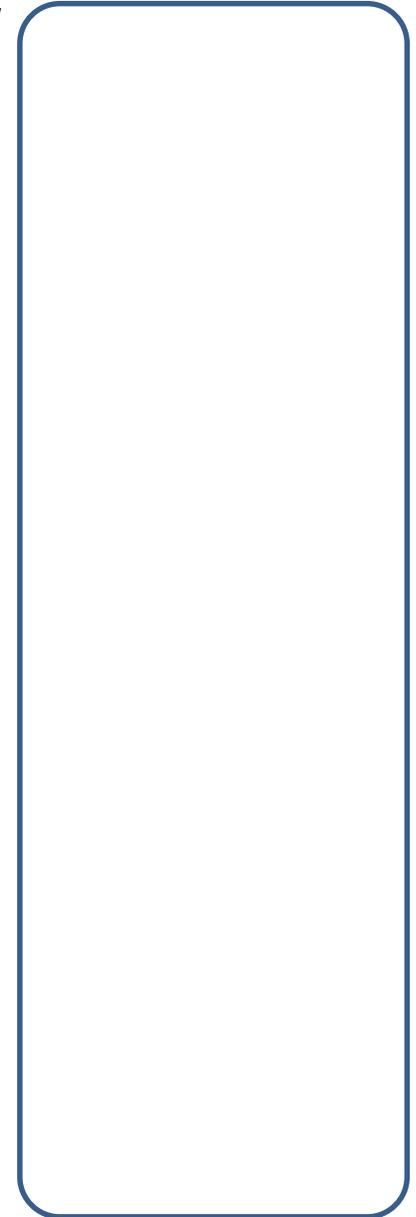
- In Unit 3 we will think about the products around us. Where did they come from, and how are they made?
- For your end-of-unit project, you will think of a new product to help improve our school. You will create either a prototype or a digital 3D model of your new product to share with our collaboration.

Do

- As a class or in small groups, read the introductory passage on **page 39**.

Discuss

- Choose an item in the classroom. Why do you think this product might have been invented? What problem does it solve?
- Thinking about the same product: Was this product made in the past? Has the way it was made changed through time or because of technology? How, and why?
- What makes a product useful?
- Can products harm the environment? How? What can we do to solve this problem?





My City Makes

Students are accustomed to being consumers, but they may not understand the process through which their products go from beginning idea, to finished product, to store shelf. The first step is to identify and research *what* their city makes. Students can do online research, or share their existing knowledge, to identify how the product was made in the past, and what technology is used to make it today.

Time: 15 minutes

Explain

- *Today we will brainstorm the unique products that are made in our city or country.*
- *We also want to think about what technology and materials were used to make it in the past, and what technology and materials are used to make it today.*

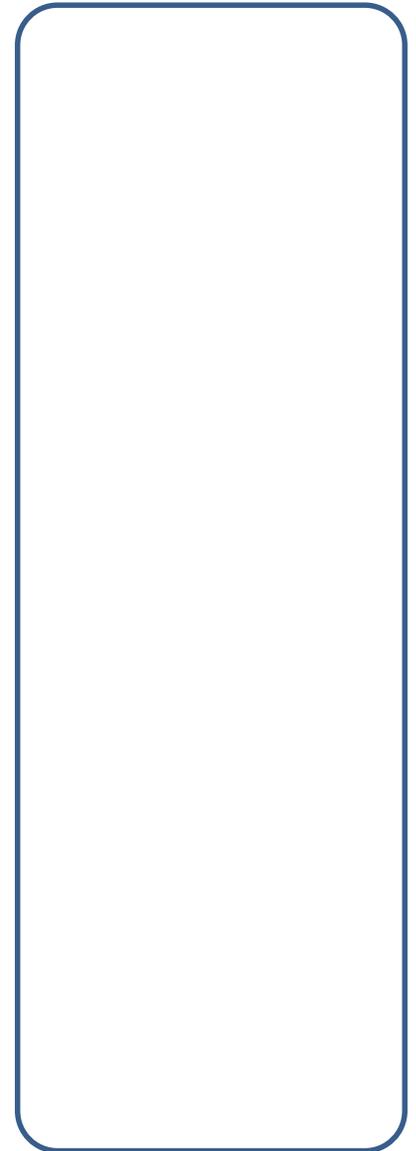
Do

- As a whole class or in small groups, identify a unique product that is made in our city or country.
- Research online or share prior knowledge: What technology and materials were used to make this product in the past? What technology and materials are used to make the product today?

Discuss

- What did you discover in your research and conversation with your group?
- What did you discover that you were surprised by?
- What did you discover that you would like to research more about?
- How does this product represent our city or country?

Workbook page 41





Global Discussion: My City Makes

Students share about a local product and how it represents their city or country. They must include a photo of their product, and write a photo credit for the image if they did not take the photograph themselves.

Time: 30 Minutes

Explain

- *Today we are writing posts about the local products that we identified earlier this week.*
- *We will share how these products represent our city or country.*
- *You must attach a photo of the product you write about. If you did not take the photograph yourself, you must include a photo credit.*

Discuss

- How can we explain this product to people who have never seen it or heard of it before?
- How can you make sure you write a good post? (Include a photo, write in complete sentences, write clearly.)
- When you post, remember that your writing can be seen by all 300 students in our collaboration, their teachers, and the Global Scholars team in New York.

Do

- Individually or in small groups, draft a message to international peers using the template on workbook **page 42**.
- (Teachers) **Review all drafts for content and appropriateness before allowing students to post online.**
- Log into the e-classroom to post your message.

Hello everyone!

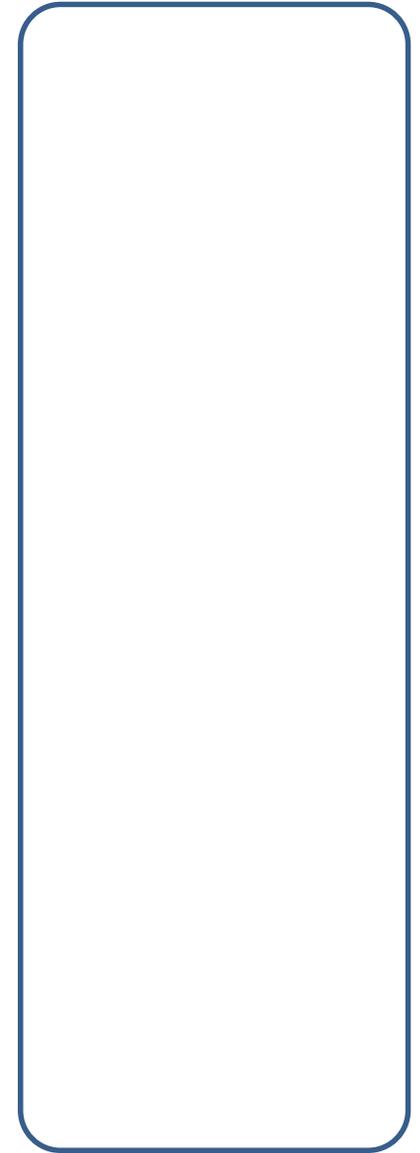
My city makes _____.

This product represents my city because _____.

One way technology has changed how it is made is _____.

Your friend,

Workbook page 42





Read and Reply: My City Makes

Students read and discuss posts from international cities. They make connections to products that are similar in their own city or country. Students should discuss the posts they read, and review how to write a thoughtful response before replying.

Workbook page 42

Time: 30 Minutes

Explain

- You will read posts in the **My City Makes** discussion to learn about products made around the world.
- You will choose one or more **international posts** to reply to. Write what you found interesting about the product, and whether this product reminds you of a product in our country.

Do

- Students read posts in the **My City Makes** discussion.
- Take notes on the products that are made in different cities.

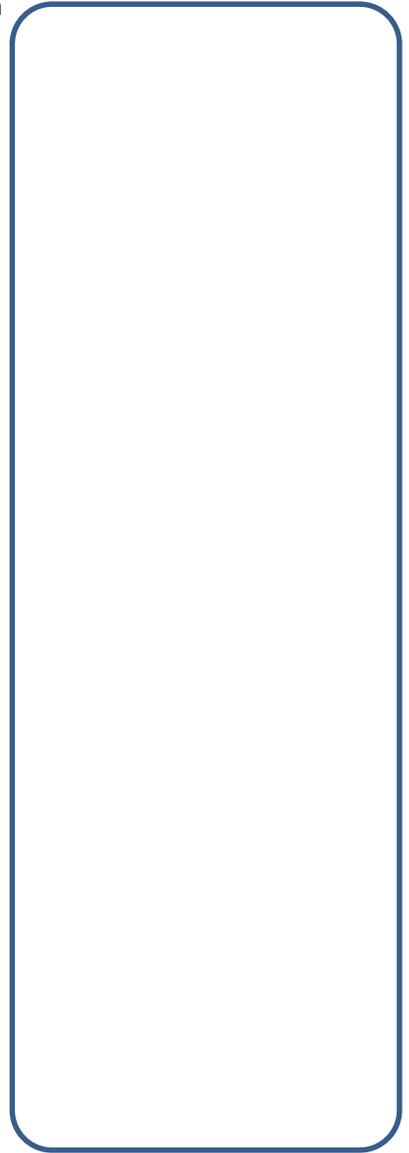
Discuss

- What products did you read about?
- What technology is used to manufacture the products?
- Do we have a product that is similar in our city/country?

Do

- Write a response to an international peer using the template on workbook **page 42**.
- (Teachers) **Review how to post a response and check all drafts for content and appropriateness before allowing students to post online.**

Dear _____,
I thought your product was interesting because _____.
One connection I made to a product in my city is _____
Your friend,



WEEK 2: Innovation Station

Students will

- Watch videos from Design Squad about innovations created by young people: **3-D Printed Hand** and **Kid Engineer-Lunch Table**.
- Understand the concept that all products are created to help people overcome a specific challenge.
- Build background knowledge about the engineering design process.

Preparation

- ✓ Preview videos in the **Innovation Station** e-classroom page.
- ✓ Read and watch the **Week 2** resources in the **Teachers' Lounge**.
- ✓ Select resources you would like to share with students.
- ✓ Set up SMARTboard or projector (optional).

Teaching Tip

Remind students they may always revisit past discussion posts to check for questions and write replies.



Innovation Station

Students watch two videos from Design Squad on the **Innovation Station** page in the e-classroom. These videos show students using the engineering design process to create a new lunch table for their school and a 3D printed prosthetic hand. This activity builds students' background knowledge about designing a product in preparation for their final unit project: A Product for My School.

Workbook page 44

Time: 30 minutes

Explain

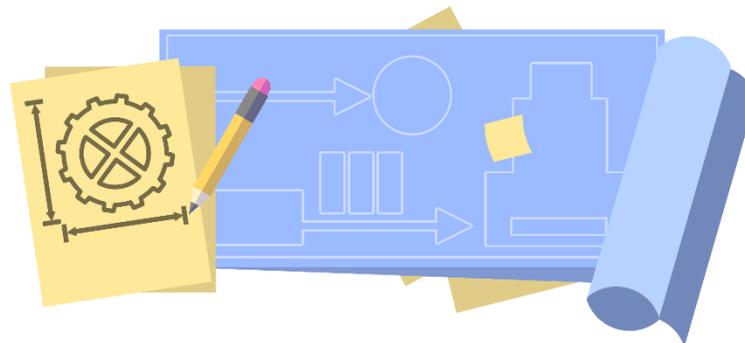
- *At the end of Unit 3, you will have the chance to create a product to help our school.*
- *Today, we are going to watch some videos about students who are creating products to solve real-life problems just like we are going to do in a few weeks.*
- *As you watch, think about why they made the product, who it helps, and what materials they used to make it.*

Do

- As a whole class, log into the e-classroom, go to the **Innovation Station** page, and watch the two videos from Design Squad: **3D Printed Hand**, and **Kid Engineer-Lunch Table**.
- Take notes on the graphic organizer on page 44: What is the name of the product? Who does it help? What materials and technology are used to make it?

Discuss

- What did you find the most interesting about these videos?
- Why were these products invented? Who do they help?
- Are all products invented to help others? Why or why not?
- What technology and materials are used to create a prototype? Are they similar to or different from the technology and materials that will be used to create the final product?
- How are prototypes helpful in the design process?





Global Discussion: Innovation Station

After watching the Design Squad videos, students share which invention they enjoyed the most, and how the video inspired them. They share initial ideas about a product they might want to create for their school. Sharing ideas and getting feedback is an important first step in the design process.

Time: 30 Minutes

Explain

- *We just explored two videos about innovations from Design Squad.*
- *We also talked about how these products were created to meet a need.*
- *Now it's time to compare experiences and share ideas in the global discussion.*

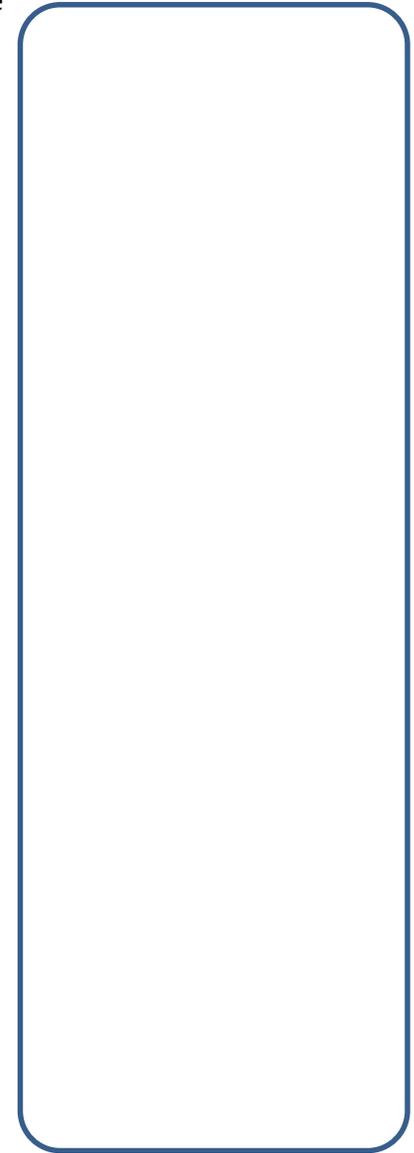
Discuss

- How can you make sure you write a good post? (Answer the questions, write in complete sentences, write clearly.)
- When you post, remember that your writing can be seen by all 300 students in our collaboration, their teachers, and the Global Scholars team in New York.

Do

- Draft a message to international peers using the template on workbook page 45.
- Log into the e-classroom and post a message to the **Innovation Station** discussion.
- (Teachers) **Review all drafts and photographs for content and appropriateness before allowing students to post online.**

Workbook page 45



Hi everyone,

My favorite invention was _____ because _____.

Something I would like to create is _____.

It would help people to _____.

Your friend,



Read and Reply: Innovation Station

Students write replies to give feedback. They share ideas in response to the new inventions that their international peers have proposed.

Time: 30 Minutes

Explain

- *Your international peers have shared their ideas for new inventions.*
- *As you read, think about ideas you could add to their invention.*
- *Choose an international post that is most interesting to you and that does not have any responses.*
- *When you post, remember that your writing can be seen by all 300 students in our collaboration, their teachers, and the Global Scholars team in New York.*

Discuss

- What does a suggestion look like? What does it sound like? (Read a post together and discuss a possible reply that students could write.)
- Why do you think giving and getting suggestions is important?
- How can you make sure you write a good post? (Write in complete sentences, write clearly, explain your thinking)

Do

- Students read posts in the **Innovation Station** discussion and use the template on page 45 to write a response.
- (Teachers) Review how to post a response and check all drafts for content and appropriateness before allowing students to post online.

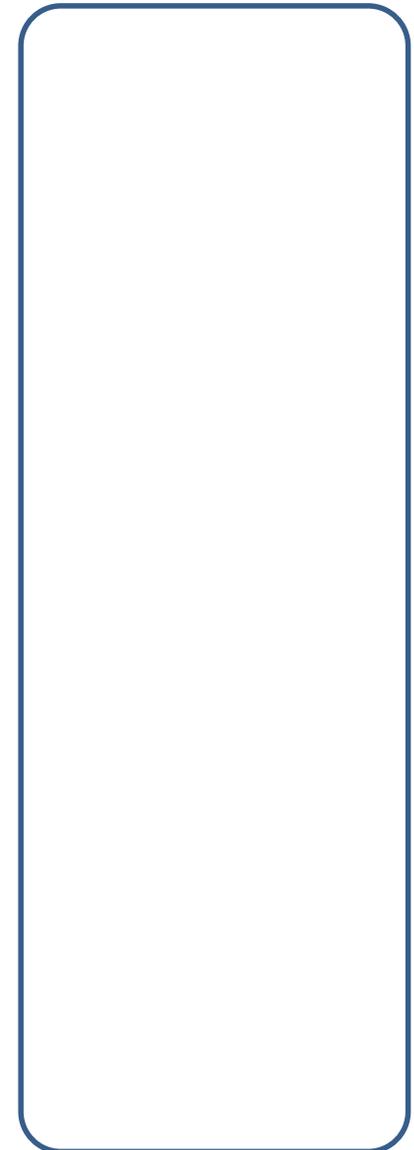
Hello _____,

I think your idea for a new invention is great because _____.

One idea I want to share with you is _____.

Your friend,

Workbook page 45



WEEK 3: Data, Data!

Students will

- Experience how inventors and product designers collect data in order to decide what products to create.
- Create and conduct a survey at their school.
- Read about the concept of Big Data and the computing cloud.

Preparation

- ✓ Download and print the *School Survey* template in the *Workbooks & Lessons* page in the *Teachers' Lounge*, also available in the e-classroom *Data, Data!* page.
- ✓ Read and watch the resources on this week's topics in the *Teachers' Lounge*.
- ✓ Select resources you would like to share with students.
- ✓ Set up SMARTboard or projector (optional).

Teaching Tips

The School Survey lesson can be integrated with mathematics by having students create pie charts or graphs to present their data findings.

Students may be nervous to speak to other students while conducting their school survey. To prepare, have students practice asking and answering questions of each other. Students may also conduct the survey in their local language.

Readings about Big Data and the computing cloud are found on page 50. You may approach these optional readings however you choose.



Data, Data! and School Survey

Collecting data is an important skill for inventors, scientists, and many other professions. Before students conduct the school survey, discuss the purpose of collecting data with them, as well as the different ways in which data is collected, such as surveys, polls, and census reports.

Workbook pages 47-48

Vocabulary: Data

Time: 60 min

Explain

- *Data is just another word for information. Inventors collect data to help them decide what type of product would be most useful to create.*
- *Today we will collect some data of our own. We will survey students at our school to learn what they need so that we can decide what product to create.*
- *For your Unit 3 project in a few weeks, you will think of a new product for our school. The survey will help you gather data to decide what product will be most useful or helpful at our school.*

Discuss

- What do you know about data and surveys? Have you or anyone you know ever participated in a survey?
- What area of our school do you think needs improvement?
- What questions can we ask people to find out what they want to improve and what products they need?

Do

- Review the survey template on **page 48** of the workbook. In small groups or as a class, write down additional questions that will be asked in the survey.
- Rehearse conducting the survey with classmates.
- Conduct the survey and write down the answers from adults and students at the school.

Discuss

- What did people want to improve at your school?
- Which answer was the most popular?
- What other conclusions can you draw from your survey results?





Global Discussion: School Survey

After conducting the survey, students share their findings and conclusions in the School Survey discussion. For this discussion, a representative from each group or the whole class can write the post.

Time: 30 min

Explain

- Collaborate with your group to draft a message to international peers using the template on workbook **page 49**.

Do

- (Teachers) **Review all drafts and photographs for content before allowing students to post online.**
- Log into the e-classroom to post your message.

Hi everyone,

We discovered that most people at our school want to improve _____.

From our survey results, we also discovered that _____.

What did you find out at your school?

Your friends,

Workbook page 49

A large, empty rounded rectangular box with a blue border, intended for students to write their message to international peers.



Read and Reply: School Survey

Students read the posts from their collaboration, discuss some of the posts in their group or as a whole class, then reply with suggestions and questions. Remind students to return to their original post to see if others have replied to them.

Workbook page 49

Time: 30 minutes

Explain

- *Today we're going to learn what happened at other schools when they conducted their school survey.*
- *We will read their findings and conclusions, and give them suggestions and feedback.*
- *Remember to check your post to see if others have replied.*

Discuss

- What makes a good reply? What type of reply would you like to receive?
- What are some questions you could ask in your post?
- What are some suggestions you might give in your post?

Do

- Write a response to an international peer using the template on workbook **page 49**.
- (Teachers) **Review all drafts for content and appropriateness before allowing students to post online.**
- Log into the e-classroom to post your reply.

Dear _____,

It is very interesting that _____.

One question we have about your survey is _____.

Your friends,

WEEK 4: A Product for My School**Students will**

- Identify a product or innovation that is needed at their school.
- Brainstorm ideas and draw sketches of their new product.
- Make a plan to define the product, how it will help people, and whether they will create a prototype or digital 3D model.
- Create either a prototype or digital 3D model of their new product.

Preparation

- ✓ Group students according to the product they are creating.
- ✓ Have students collect recycled materials such as cardboard, wood, and plastic from which to create their prototype.
- ✓ If students are creating digital 3D models, explore SketchUp (<http://www.sketchup.com/>) or Tinkercad (<https://www.tinkercad.com/>).
- ✓ Make sure you or a group of student experts is familiar with SketchUp, Tinkercad, or other 3D modeling program being used by students.
- ✓ Review your classroom's rules and procedures for group work.

Teaching Tip

Lessons during project weeks are flexible. Some steps of the design process may take your students longer, or you may choose to combine steps or skip a step completely. The lessons that follow are suggestions for implementation. Please plan according to students' needs, and ensure that they are able to spend the majority of their time working on their projects.



Digital Project: A Product for My School

Students create a new product, or innovate one that already exists, to improve their school. They can choose whether to create a physical prototype of their product, or a digital 3D model.

Workbook page 51



1 Identify a Need

Digital projects are always based on a real need that students identify at the school or community level.

Time: 10 minutes

Discuss

- When you conducted your school survey, what did you find people needed?
- What conclusion did you come to?
- What product do we need at our school?
- Or, What product do we already have at our school that you would like to improve?



2 Brainstorm (optional)

Students record their ideas, share them with others, and give feedback. They may watch the video called **How to Sketch** from Design Squad on the **Unit 3 Digital Project** page in the e-classroom.

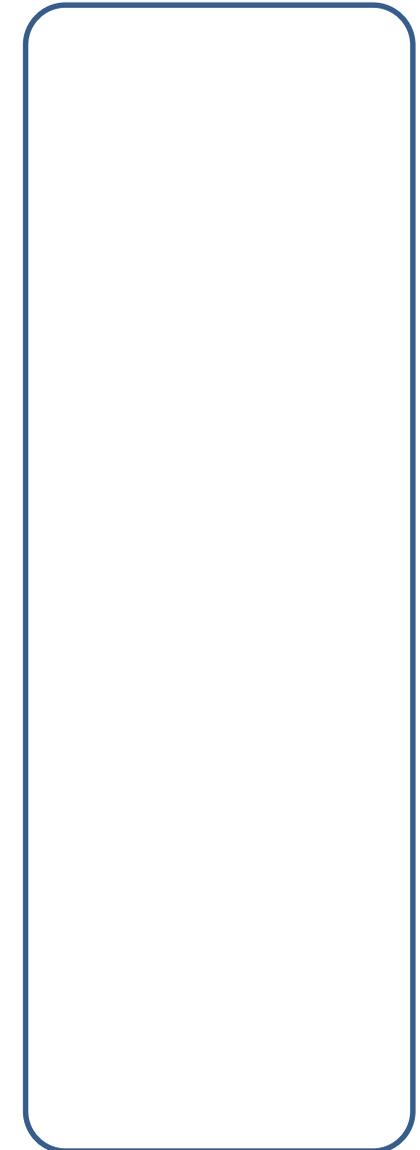
Time: 15 minutes

Explain

- *Next, you will discuss, write, and draw the first ideas you have for your new product.*
- *Remember, no idea is too strange and every idea is important!*

Do

- Watch the **How to Sketch** video from Design Squad on the **Unit 3: Digital Project** page in the e-classroom.
- In small groups or as a class, discuss, write, and draw all your ideas for a new product.





Make a Plan

Students answer essential questions about the product they will create, including what makes it useful. They must decide whether to create a prototype, or physical model, of their product out of recycled materials, or to draw a 3D sketch using a digital tool such as SketchUp (<http://www.sketchup.com/>) or Tinkercad (<https://www.tinkercad.com/>).

Time: 30 minutes

Explain

- *Today we are making a plan to get focused on creating our new product and its prototype.*
- *You will decide if you are creating a prototype, or if you will create a digital 3D sketch.*

Do

- In their project groups, students answer the questions on **page 52** of the workbook.

Discuss

- What were your decisions? (Check in with students and give them feedback on the product they will create, where it will be used, and who it will help. Keep track of whether students are creating a prototype or a digital 3D sketch, and help them locate materials for their project if needed.)



Create!

In this step, students gather in their groups and work to create their product. They will continue the following week as necessary.

Time: 60 minutes

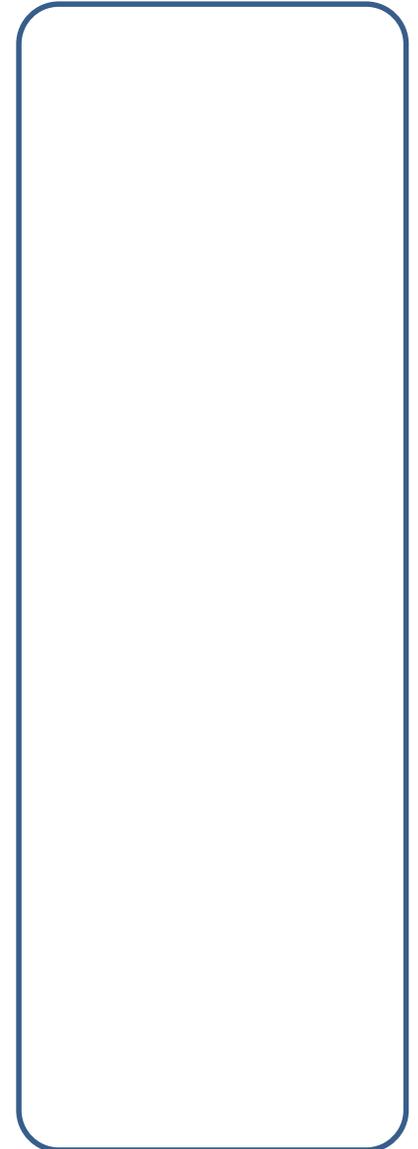
Explain

- *Now you are ready to create your prototype or digital model.*
- *Your group will work together for the rest of the week and beginning of next week.*

Do

- Review your classroom's rules for group work.
- Students are allowed time to work on projects.

Workbook page 52



WEEK 6: A Product for My School**Students will**

- Finish creating their prototype or digital model.
- Share their inventions in the e-classroom.
- Give and receive feedback about their inventions.
- Reflect on their learning in Unit 3.
- Identify inventions by international peers that might be used at their school.

Preparation

- ✓ Create charts to help students remember the steps to “Test It Out” and “Revise.”
- ✓ Create a rubric using the requirements of the project to guide students.

Note

Students may need explicit guidance when working together. It is helpful to teach and practice the language for collaborative discussions and making group decisions. Students can practice these conversations by role-playing conversations for their classmates.

Conversation prompts:

“My idea is...”

“I like what you said. I agree that...”

“I have a different idea. I wonder if we could...”

“What do you think about doing it this way?”

5 Test It Out (optional)

Students make improvements to their prototype or digital model. Students should use the majority of their time this week to work on their project.

Time: 60 minutes

Explain

- Today you will test your product to see if it works.
- You will use the checklist on **page 53** to remind you:
 - Does it solve the problem?
 - Is it easy to use?
 - How could it be better?



Discuss

- What changes did you make? Why?

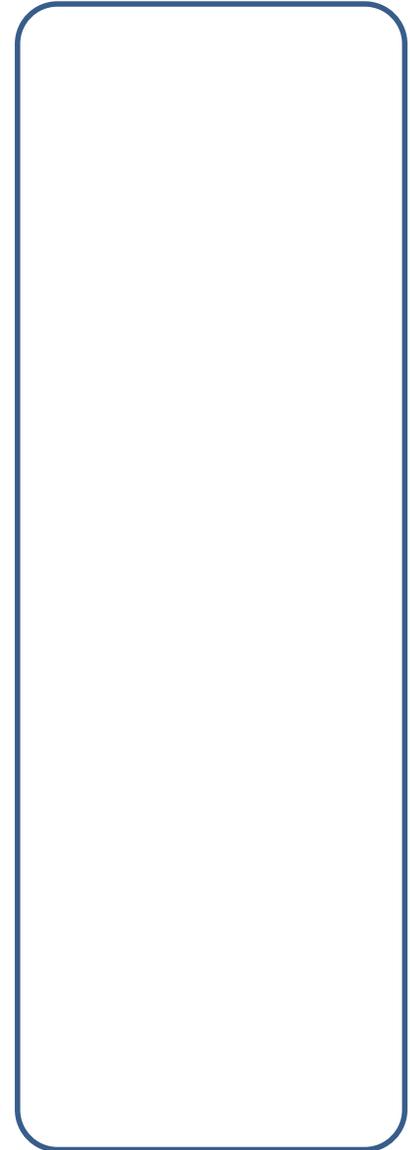
Do

- Review classroom expectations for independent work time.
- Work individually or in groups to revise projects.

7 Share

Students use the global discussion templates on **page 54** to share their projects and give feedback to others.

Workbook page 53





Unit 3 Project: A Product for My School

Students share their Unit 3 project in the global discussion. They post photographs of their prototype or attach the digital file of their 3D model to their discussion post.

Workbook page 54

Time: 30 minutes

Explain

- *An important step in Global Scholars is sharing projects with our international peers.*
- *Today you will post your project so that your international peers can give you feedback.*

Do

- In groups, post an introduction to your project.
- If you created a digital 3D model, attach your project file.
- If you created a prototype, take photographs and attach them to your post.

Hi everyone,

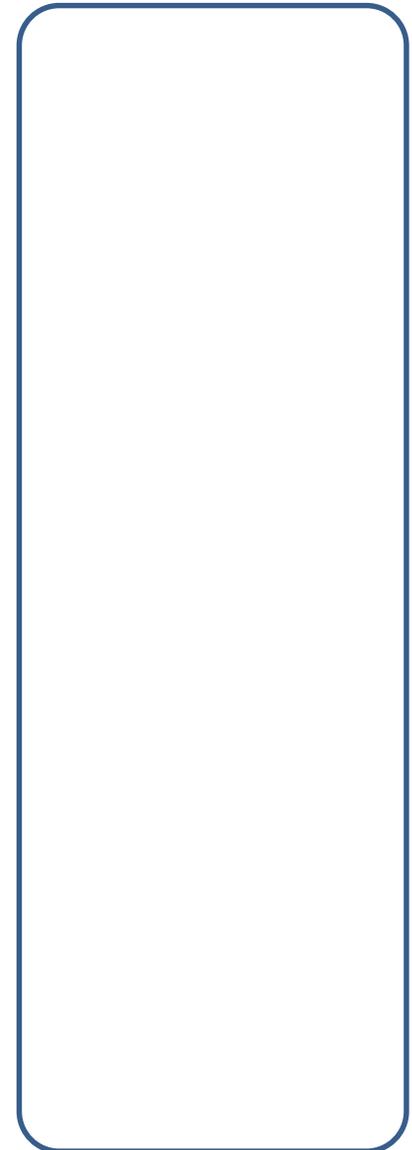
We created a _____ .

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

Students give feedback to their international peers about their Unit 3 project. They review the purpose of feedback, and share ideas for how to give helpful feedback to others.

Time: 30 minutes

Explain

- *Seeing projects from around the world helps us understand others' points of view and gives us ideas for our own projects.*
- *Helpful feedback shares a compliment, a suggestion, and a question.*

Do

- In groups or as a class, read and view the posts from international peers.
- Read a sample post together as a class, and model how to write helpful feedback.

Dear _____,

Your product seems useful because _____.

We wonder why _____.

We would like to suggest that _____.

Thanks,

Workbook page 54



Unit 3 Reflection

Students reflect on their learning in Unit 3. As teachers facilitate the discussion, they can help students understand new perspectives and cultural differences they have encountered.

Time: 30 minutes

Do

- Write or discuss responses to reflection questions:
 1. What topic did you find the most interesting in Unit 3?
 2. What was the most challenging part of creating your product?
 3. What were your favorite products from around the world?
 4. Which product would be useful in your city? Why?

Discuss

- Which international cities have you replied to so far?
- Set a goal: What other cities would you like to write to in the next unit?
- What have you noticed about each city?
- What did you learn that surprised you?
- What similarities did you notice between your school or city, and other schools and cities? Why do you think we have these similarities and differences?