

# Challenge 3: How do we create an engineering model?

## Get Prepared

**Challenge Goal:** Learn about the concept of an engineering model and then build a scale model of their community

**Time Needed:** Four 45-minute sessions (as needed to complete the 3D models)

**What You Will Need:**

### Printouts

- **Activity Sheet C: 3D City**
- **Letter to the Editor Template (optional)**

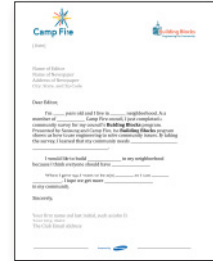
### Materials

- Samsung tablets
- construction paper
- pencils and markers
- glue gun
- craft materials (yarn, pipe cleaners, glitter, etc.)
- grid paper
- cardboard
- rulers
- scissors
- glue or tape
- Popsicle sticks and toothpicks

### Connect With the Community (optional):

After kids have completed Unit 1, and the engineering in our community worksheet, they will have identified important needs in their community. Now you can give them a chance to have their voices heard! Wrap up the unit by helping them write letters to the editor of their local newspaper about their community's needs. After they've researched the address of their favorite local newspaper, download the **Letter to the Editor Template** to help them figure out what to say.

**Note:** Kids may use the activity sheet printouts or they may follow along on their tablets at: [www.scholastic.com/sparks2](http://www.scholastic.com/sparks2).



## SESSION 1

## Spark Exploration: STEM Careers 10 mins.

1. Direct kids to take out their tablets, open the **STEM Career Flip Book**, and read about civil engineers in the Engineering section. Ask: **What role do you think civil engineers played in the engineering of your neighborhood?** Ask them to reflect on what goals people in the careers would set and reflect on what is important about the work these engineers do. Provide background and some fun insights with the following information:

- **The oldest example of civil engineering is one of the Seven Wonders of the World.** The Great Pyramid at Giza is at least 5,000 years old. It was

the tallest man-made structure in the world for nearly 4,000 years, which is even more impressive when you consider that it is said that it was built as a tomb.

2. Wrap up the conversation by asking: **If you were a civil engineer and could build anything in your neighborhood, what would you build and how would you build it?**

After the discussion, explain that you will continue to discuss careers from the **STEM Career Flip Book** on future days.



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## Challenge 3: How do we create an engineering model? (continued)

### Setting the Strategy: Engineering in the Community 10 mins.

Show kids an image of an architectural model on your tablet, using the following link: <http://architecturalmodels.tumblr.com/>. Explain that a model is a 3D representation of an object or structure. Together, use the examples to identify key characteristics of an engineering model such as:

- Built to scale
- Detailed
- Includes models of the surrounding environment
- Often includes models of people

Then help kids develop a definition of the term *3D engineering model* that answers the following questions:

- **Why do you think models are important to engineers?** (They help them show others how an engineering

project will look, and function in the communities where the projects will be built. A model is also a visual representation of the strategies an engineer implements to achieve goals.)

- **What do engineers have to consider before building a model?** (How large the real-life structure will be and how the real-life structure compares to the size of the model; in determining the size of the model, engineers will consider the area of the space where the real-life structure will be built, the scale they will use to build the model, the structures and terrain that will surround the structure, the materials that will be used to build the structure, as well as the goals the structure will need to achieve.)

### Use the Tablets! 25 mins.

1. Have kids break off into their teams.
2. Each team will now have a chance to build a 3D model of a part of your community!
3. Ask each team to start by selecting what they want to build. Ask teams to use their tablets to view their community on **Google Maps**. They should select an area that's no more than one block in an urban or town environment and ¼-mile of a rural space. For example, a local train station, farm, or skating rink.
4. Teams should view their selection using **Street View**, **Google Earth**, and **Photos** and bookmark the pages for reference later.
5. Distribute a copy of **Activity Sheet C: 3D City** to each team and ask them to get ready to build by completing the following tasks:
  - Print out a map of their location (using **Google**

**Maps**) and draw a 1-inch by 1-inch grid on top as a scale reference (as they did in Activity 2).

- Sketch the *footprint* of their models on **Activity Sheet C: 3D City**. They should use a scale of 1:3 so that 1 grid square from **Google Maps** equals 3 grid squares on their worksheets. This footprint should show how much area each element of the model will cover. Show and label everything you intend to build including houses, trees, parks, etc.
- Sketch the front, back, side and top of their location to show what the outside of it will look like.

#### Wrap-up and Reflection Activity:

6. Have students consider what they want their models to show overall. Are they showing large buildings, highways, or residences? Have they included community spaces, such as a park? Why did they choose the specific segment for their models?

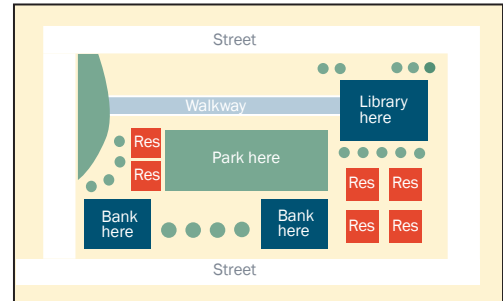
## Challenge 3: What is innovative engineering? (continued)

### SESSION 2

## Shifting Gears: STEM Challenge! 45 mins.

**To Get Started:** Remind kids that they discussed engineering models in the previous session. Ask students to name a few reasons why models are so important to engineers.

1. Now that kids have used the first session to plan out their models, they are ready to build! Pass out large pieces of cardboard for kids to use as the bases for their models. Glue **Activity Sheet C: 3D City** to the cardboard base.
2. Instruct kids to fill in the street names, buildings, and other structures they will include in their models. This will be a flat plan where they will place all the structures and elements that will be included in their models. A good way to describe this would be to liken the foundation to a place mat with shapes and designations as to where a plate, fork, or cup would go. Please refer to the illustration to the right for a visual example of a foundation.



3. After kids complete this task, they can start making their model structures as described in session 3. If not, they should have sufficient time to cut the foundation and draw in the model elements by the end of session 2.

### Wrap-up and Reflection:

4. Ask kids to think about why laying out a foundation prior to building a model is so important. Guide kids to think about spaces and structure sizing. Do they notice anything they may want to include in the 3D model based on their learnings from this activity?

### SESSIONS 3 and 4

## Shifting Gears: STEM Challenge! 45 min. Sessions

**To Get Started:** Remind kids that they started building their models in the previous session. Ask them to discuss any challenges they came across during this process.

1. During the final sessions of this activity, kids should use the time to build the buildings, trees, and other structures that will make up their models. Explain that this project will require them to think creatively about how to make the structures in their models. Explain that they can use popsicle sticks and toothpicks to build the structure of houses and other buildings. They can then cover the popsicle sticks with construction paper to serve as walls and roofs. As kids work, encourage them to evaluate whether they are on track and provide feedback on the construction of their models. Remind them to use all the materials they have access to and to use their creativity. Answer any questions teams may have if they become stuck and encourage them to reflect, shift gears, then revise their models as needed.

### Wrap-up and Reflection:

2. Depending on how quickly kids finished session 2, they may only need one session (session 3) to complete their models. If you find your kids need an additional day to put the finishing touches on their models, provide them with more time to wrap up so that they will have models they can be proud of.



TEAM NAME: \_\_\_\_\_

## 3D City

Maps are very useful, but the view they show of the world can fall, well, flat. Engineers draw their ideas, then build 3D models of their sketches. Use this page to build a model of one part of your community!

The scale of this model is 1:3.

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