Meeting-in-a-Box: Engineering

*This meeting is aimed at **Sparks** and covers portions of the **Exploring and Experimenting** keeper as well as other parts of the program. It was originally created for **National Engineering Month** (March) but can be used at any time of the year. There are enough elements for about **two hours' worth of activities**, but you can pick and choose or run more than one meeting with this theme.*

Art  Discussion  Game  Skills  Science 

Table of Contents

Supplies

- ☐ Lemons
- ☐ Baking Soda
- ☐ Cups
- ☐ Spoons
- ☐ Sugar
- ☐ Lemon Juicer
- ☐ Small container
- ☐ Dominos or Jenga blocks
- ☐ Hair Dryer
- ☐ Baking soda
- ☐ Cooking Oil
- ☐ Citric Acid (found in the canning section of grocery stores)
- ☐ Ziplock bags
- ☐ Mixing bowls
- ☐ Print-outs of Appendix 1
- ☐ Scissors
- ☐ A book
- ☐ Paper clips
- ☐ Paper
- ☐ Tape
- ☐ Markers or pencil crayons

Activity 1: Intro

(10 minutes)

Start by asking questions:

- Do you know what an engineer is?
- Do you know any engineers?
- What kind of work does an engineer do?
- Can you name things around you that engineers were involved in making?

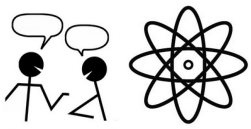
Activity 2: Engineer your Lemonade

(15 minutes)

Have you ever made a rocket or volcano out of baking soda and vinegar? You're going to use the same science to make something to make the tastiest, coolest, sciencyest, egineeriest lemonade ever.

- Squeeze a lemon into a glass and add an equal amount of water.
- Stir in a teaspoon of baking soda
- Add sugar to taste

Take a sip and notice how fizzy your lemonade is. As you mixed the baking soda and lemon juice you created a chemical reaction. Bases (baking soda) and acids (lemon juice) mix together to release carbon dioxide (CO_2), which is the same gas as makes pop fizzy.

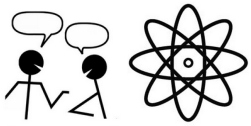
Activity 3: Book Tower 

(15 minutes)

Have the girls sit in a circle. In the middle of the circle, place a sheet of paper. Ask your Sparks how solid paper is. Ask them what kind of shape you make with paper that might hold up a book. You can try folding it or crumpling it. Eventually, the girls will tell you that paper isn't very strong.

At that point. take a new piece of paper and roll it and tape it into a cylinder. Make sure the base is wide enough that it can stand up on its own. Then, place a book on top and show the girls that it doesn't crumble. In fact, you could place many more books.

Have the girls, one at a time, come up and press down on the book to show how strong the paper is.

Activity 4: Brave the wind 

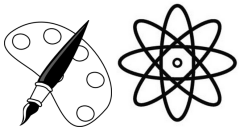
(20 minutes)

Divide Sparks into a few small groups and give them objects such as Jenga blocks or dominos to make a tower. Tell them that they are trying to make it both high and solid.

Engineers often have to think about how nature might affect the things they build. Once the towers are built, have the girls stand in front of them and blow. Do they fall over?

If they don't, use a hairdryer to see whether the buildings can stand stronger "winds." Start a ways off and move progressively closer with the hairdryer to see how much wind the towers can stand.

Discuss which structures were most solid and why. Can the girls think of any ways in which real buildings are built to withstand storms?

Activity 5: Homemade Bath Bombs 

(30 minutes)

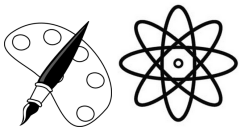
In this activity, girls are going to be making bath bombs that they can take home and use at bath time. You may wish to divide the girls into small groups to do this so that they can all be involved.

1. Add ¼ tsp of water to ½ cup of baking soda. Mix well.
2. Mix in 1 Tbsp of citric acid. You may notice a bit of fizzing or that the mixture gets cold. This is normal.
3. Add 1 tsp of cooking oil
4. Form into bath-bomb sized balls. The dough should be dry and crumbly but just stick together. If you need to, add ¼ tsp more oil.
5. Write each girl's name on a ziplock bag so that she can take one home. They will be much more solid after drying overnight so wait at least 10 hours before using them.

The girls can add them to their baths at home and watch them fizz in the water. They may also notice that the bomb gets cold as this is an endothermic reaction (one that takes in energy or heat). Warn parents to be careful because the oil in the bath bombs may make the tub slipperier than usual.

If you can, keep one bath bomb aside and show the girls what happens in a tub of water the next week once it has had time to dry.

This activity comes from: http://www.funathomewithkids.com/2013/10/diy-bath-bombs-magic-hatching-dinosaur.html

Activity 6: Paper Helicopters 

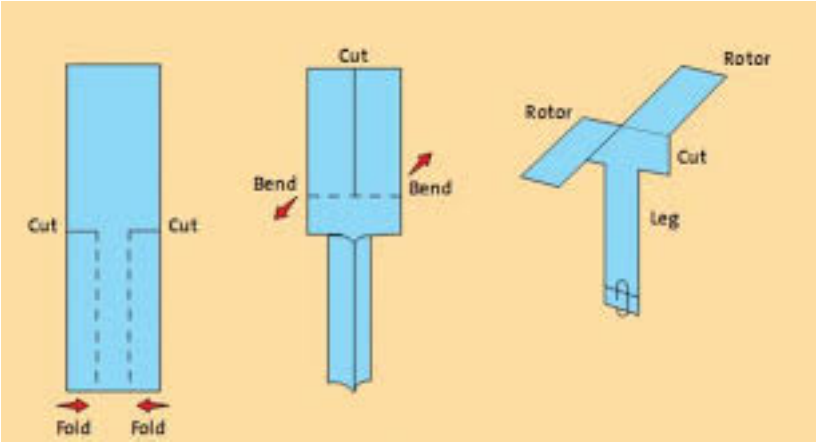
(20 minutes)

Print and cut out one of the helicopter template rectangles found in appendix 1 for each Spark.

With your help, they should be able to do the folding and cutting

1. Decorate the rectangles with the markers/pencil crayons
2. Cut the small lines above A and B and fold the flaps inwards
3. Cut the line down between D and E and fold the flaps down and then slightly back up
4. Fold the very bottom (below C) up and attach it with a paper clip

The helicopters should now turn and fall slowly. If you have a staircase, try throwing them from the top of the stairs. Otherwise, the girls can throw them from as high as they can reach.



Program work completed

Activity	**Spark Program Work Completed** * Please note that the program doesn't necessarily match up exactly with the numbers indicated, but that the activities accomplish similar goals
Introduction	
Lemonade	Being Healthy #8
Book Tower	
Wind	
Bath Bombs	Exploring and Experimenting #1
Helicopters	Exploring and Experimenting #4

Meeting Submitted by Elizabeth Knowles with help from Robin Yee and Rachel Collins in February 2015

Appendix 1: Helicopter Templates