Bay Area Scientists in Schools Presentation Plan

Lesson Name Marshmallow Challenge: A Tower Building Adventure
Presenter(s) Gautham Venugopalan
Grade Level 2 **Standards Connection(s)** Objects fall to earth unless held up. Positions can be described.

Next Generation Science Standards:

K-2-ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.
K-2-ETS1-3. Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs..

Science & Engineering Practices	***Disciplinary Core Ideas***	***Crosscutting Concepts***
Asking Questions and Defining Problems Asking questions and defining problems in K–2 builds on prior experiences and progresses to simple descriptive questions. Ask questions based on observations to find more information about the natural and/or designed world. (**K-2-ETS1-1)** Define a simple problem that can be solved through the development of a new or improved object or tool. (**K-2-ETS1-1**)	**ETS1.B: Developing Possible Solutions** ••Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (**K-2-ETS1-2**) **ETS1.C: Optimizing the Design Solution** Because there is always more than one possible solution to a problem, it is useful to compare and test designs. (**K-2-ETS1-3**)	**Structure and Function** ••The shape and stability of structures of natural and designed objects are related to their function(s). (**K-2-ETS1-2**)

Common Core Standards:

ELA/Literacy:

W.2.8 Recall information from experiences or gather information from provided sources to answer a question.

Mathematics:

MP.2 Reason abstractly and quantitatively.
MP.5 Use appropriate tools strategically.
MP.4 Model with mathematics.

FOSS Connections:

Grade 2 Module: *Balance and Motion*

Investigation 2: *Balance*

Teaser: *Your opportunity to tell teachers and kids what's going to be fun and interesting about your visit!*

Structures are an important part of our lives. We live in buildings, cross bridges, and climb jungle gyms. All of these structures have to be strong and hold up heavy things. Today, we'll use everyday materials to design our own structures. Our structures will need to hold up a marshmallow at the top. Whichever team builds the tallest stable structure wins a prize! (Hint: it may be a marshmallow.)

Objective: *As a result of your lesson, what will students learn? What will they be able to do?*

Students will get hands on experience building a stable structure in teams. They will learn also learn about rapid trial and error – a skill essential in early phases of engineering design.

Vocabulary/Definitions: *3 – 6 important (new) words*

- **Structure**
- **Free-standing**
- **Prototype**

Materials:

What will you bring with you?

- Tape measure
- stopwatch
- Kits with the following:
  - uncooked spaghetti,
  - string/floss
  - marshmallow (don't eat me!)
  - masking tape

What should students have ready?

- Each group should have a pair of scissors and a flat surface to work on – preferably a desk, table, or hard floor.

Classroom Set-up: *Student grouping, Power/Water, A/V, Light/Dark, set-up/clean-up time needed*

Students should be divided into groups of 4. One or two groups of 3 are ok.

Classroom Visit

1.

Personal Introduction: 5 Minutes

Who are you? What do you want to share with students and why? How will you connect this with students' interests and experiences?

I am an engineer. I build and design things all the time. Some things that I've built recently are: a water tank and filtration system and a microscope. These are all very stable structures.

Topic Introduction: 5 Minutes

What questions will you ask to learn from students? Big Idea(s), vocabulary, assessing prior knowledge…

In engineering, a structure is anything that supports people and things. For example, this school building is a structure because it supports us. Can you think of other structures? (i.e. bridges, chairs, tables, beds).
A free-standing structure is something that stands up by itself without any help. Is a newborn baby a free-standing structure? How about you? Can you be a free-standing structure?

2. Learning Experience(s): 30 Minutes

What will you do, what will kids do? Demonstrations, hands-on activities, images, games, discussion, writing, measuring… Describe in order, including instructions to kids.

Have them in teams. Tell them to make team names.
Using only the items in this bag, build the tallest structure you can.
Some rules:

- The marshmallow goes on top.
- You have 18 minutes, then it's hands off!
- You can break the spaghetti, tape, string however you want.
- The winner is the team with the tallest free-standing structure – measured from table to marshmallow.
- No eating the marshmallow!

After 18 minutes we'll measure each team's tower height.

3. Wrap-up: Sharing Experiences _____ Minutes

Putting the pieces together – how will students share learning, interpret experience, build vocabulary?
What worked well?
What didn't work so well?
In engineering, when we make a test object, it's called a prototype. Prototypes usually have things that work well and other things that don't. We learn from them and use our new knowledge to improve design.

4.Connections & Close: _____ Minutes

What else might kids relate this to from their real-life experience? How can they learn more? Thanks and good-bye! Clean-up

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When you aren't sure if something will work, make a prototype! It's a great way to learn about something you're interested in. You can make prototypes when you're building structures, but also with anything else you want to design!

Total 50 – 60 Minutes

Differentiated Instruction:

English Learners: Repeat directions, if necessary, and physically model how to use the spaghetti and marshmallow. Write vocabulary, e.g. structure, free-standing, on the board and read words aloud. Vocabulary words can also be visually demonstrated, e.g. using an illustration, and/or redefined in very simplistic terms.

Advanced Learners: Have students built different structures and write why they believe certain ones are more sturdy than others or provide more support for the marshmallow.

Follow-up - After Presentation

ELA Activity:
Students answer the following prompt:

"Write a letter to a friend explaining what you learned about building structures. Draw a picture of your marshmallow support structure."

Mathematics Activity:

Have students measure, record, and graph the heights of their structures in inches and centimeters.

Other:

More information about this lesson can be found here:
http://marshmallowchallenge.com/

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