

## **Engineering on a Dime: Paper Bridges (Grades 3-5)**

In this engineering lesson, students will learn about real-life bridge design and use their knowledge of forces to build a strong bridge that supports as many pennies as possible...using only paper

**3-PS2-1** Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.

**3-5-ETS1-1** Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

**3-5-ETS1-3** Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

### **You will need to provide the following:**

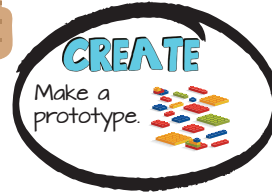
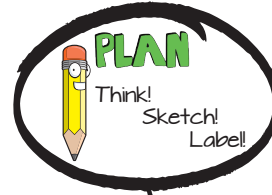
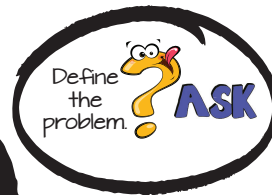
- Paper – regular 8-1/2 x 11 sheets – lots of it! If you have a recycle bin near your school copier I would use that paper! I would hate for you to waste perfectly good paper for this! While students will only be able to use 2 pieces in their final design, they may go through many sheets during the engineering process when they are trying to improve their designs.
- Pennies (lots of those too!) - These will be used to test the bridges and I have seen some paper bridges hold over 100 pennies! You might consider asking kids to bring them from home if you don't have a big stash of pennies! As long as your school's COVID rules allow for sharing, the students can share since they won't all necessarily be testing their bridges at the same time.
- Books/boxes or something to prop their bridges up on. Each student or group will each want 2 stack approximately 6 inches high for their bridge to span between! 2 pencil boxes high is about perfect!

### **Teacher preparation prior to the lesson:**

- Ensure you have the above materials
- Make copies of the attached engineering design process (optional...I will also be showing the process during the lesson.)

**Note:** This engineering activity can be done individually or in groups (pairs work best), depending on your school's COVID rules. You can determine how you want this to happen!

# The Engineering Design Process



## ***Program Connection Information***

***Please use an external microphone (conference style) rather than the integrated one in the computer for the audio for your class and locate it centrally in the room. It can be difficult for the Greenbush teacher to hear the students using the computer microphone and therefore it reduces the interactive nature of the lesson. It is fine to use the computer webcam for your video source.***

All classes will take place using Zoom desktop video. If your building is already set up to use a desktop video application with a computer, simply open a browser and enter <https://greenbush.zoom.us/j/2326746414> in the URL space. You may need to download Zoom launcher software (free download) if you don't already have it. This needs to be done in advance of the lesson.

If using a Polycom video conferencing unit (or any legacy type video conferencing unit) to connect to a ZOOM conference, make sure the unit is in "encrypted mode" then dial the following IP on the internet: 162.255.37.11 or 162.255.36.11 and once connected, they will ask for a MEETING ID: enter 232 674 6414 (for Lisa at Science Center).

It's always a good idea to touch base with your district technology facilitator prior to your program to make sure all systems/equipment are in place and operational and that there aren't any firewalls in place that might prevent you from connecting to Zoom.

Once you connect, you will enter a Zoom waiting room. Your Greenbush teacher will admit you into the final meeting room.

If you have questions, please email me at [lisa.little@greenbush.org](mailto:lisa.little@greenbush.org)