



WATER WARRIORS

COMMUNITIES FIGHTING FLOODS WITH STEM



JASON
Learning

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EDUCATION THROUGH EXPLORATION

ACTIVITY #2: TESTING FLOOD BARRIER PROTOTYPE

Ideation and design are important and challenging early steps in creating new solutions to fight floods. But taking these concepts from paper or computer and bringing them to life is where the rubber really hits the road.

An important step in this process is to create a model (prototype) of your idea and then test it under realistic conditions. Since early ideas will invariably need to be improved (iterated), it's critical to strike an appropriate balance between the expense, speed and accuracy (realism) of your tests.

In this activity, your students will build a paper house from a template and test if their flood barrier prototypes can protect it from "flooding". Extensions are suggested if you have access to more advanced materials and technology (e.g. 3D printers).

LESSON PLAN

This activity is designed to accomplish the Water Warriors Day of Design challenge:

https://docs.google.com/document/d/1C2AB0WOvKR8GoquSk4NBHuxMHvmRwSR8ZH1_dtEZfJk/edit

TIME: 3 - 4 instructional periods. 2 - 3 hours.

MATERIALS:

- ◆ Use materials you already have and adapt the project requirements to fit. Any plastic bin or aluminum pan can be effective. Use whatever you have available. If your container is a larger size, you may need to increase the amount of water. If smaller, smaller amount of water.
- ◆ There is a significant amount of consumable supplies in this lab. Scaling down the size of the house will help in lowering the amount of consumable supplies you will need to have on hand.

PRECAUTIONS: Make sure that water experiments are away from any power sources or electrical devices, and have paper towels ready for accidental spills.

ACTIVITY. CREATE A MODEL TO TEST YOUR FLOOD BARRIER PROTOTYPE USING CLASSROOM MATERIALS

Create a house model

Each student or team will need at least one house model. This can be created easily by printing out a house model on a single piece of paper:

https://docs.google.com/presentation/d/1zTI_MYUFB1AsjvRzPtg-jXL8asdTbedcZMe9VgjTHCM/edit?usp=sharing

For a more sturdy version, you can print the design on cardstock instead of standard computer paper.

Test the efficacy of flood barrier models

Have your students or teams place their “house” in a flat container and apply their flood barrier. Once the houses and barriers are in place, provide each team with a container with enough water to fill the container with an inch or two of water.

Set a timer or stop-watch for 10 seconds.

Once the barriers are complete, provide each team with a container with 2 cups of water in it. Using a stopwatch, set a 10 second timer. When you say go, all groups will add the water at one corner of the pan. At 10 seconds call out “LIFT” and students will lift their house from the pan.

STEP 4. (OPTIONAL). Refine Your Prototype

If you have the time and the resources, use what you have learned by testing your prototype and improve your solution. You can do this once, twice, or as many times as possible.

Final Stage is to Share your Results. Even if the solution does not work it is important to share what failed and why. As a class you could share how all of the solutions worked and then post this to to the **Day of Design** so that your students can get the **Water Warriors Design Thinking BADGE**.

EXTENSION ACTIVITIES:

***For an extension of the activity you can have students build foundational structures that lift houses off of the ground. The link below is an additional suggested resource for this lab. While it is an advanced lab, it uses the same consumable materials as the original lab.*

Link to resources for an extension activity: <http://www.scienceinschool.org/content/>

3D PRINTER EXTENSION

Extension activity: Much of the damage caused by flooding is due to the dirt and mud that travels with the water. To showcase why clean up efforts are so significant, you can adapt this lesson using a 3D printed model. The link below is a simple house design without a roof so that you can see what is happening during “flooding”. The 3D print can be printed from your own 3D printer or you can purchase a print to be sent to you.

<https://www.thingiverse.com/thing:2517413>

3D Print the model and then add a piece of cotton batting or a paper towel inside the house. Add three drops of food coloring to the other side of your flood barrier. If water does get past the barrier, it will pick up the dye and carry it inside the house. The cotton batting will be stained, symbolizing the destruction caused by mud stains that occur on walls, furniture, and flooring after the flood waters recede.

***Additional extensions would be to design a system that would lift the base of the house off the ground. The design could include having open air space for 3 season living, or car parking under the house so that during floods-the house itself would stay dry. Students would want to research flood plains to identify how high the home should be lifted from the ground and then create stabilization systems that could withstand storm surge.