SCIENCE CAREER ADVENTURES

# Architect: Building Strong Structures

## NGSS Standard: MS-PS1-4

## Adventure Description:

In this adventure, you will think like an architect and design a movable flood wall to stop flood waters from damaging a building.

## Activity

Teacher Note: This activity is long and can be completed across multiple days. Complete Steps 1-3 on one day and Steps 4-5 on another day.

### Step 1: Background Information on Flooding (5-10 minutes)

- Show Video: Building Strong Structures.
- Explain to students that the rise in Earth's temperature will lead to an increase in flooding. Show Handout: Why More Flooding Will Occur.
- Next, explain to students that architects must find ways to protect buildings from flood waters. One way of keeping the flood waters away is by building a flood wall. These walls are strong and waterproof so that they stop the flood water from reaching the building.
- Show Handout: Examples of Flood Walls. As a class, discuss how flood walls can be designed in different ways and built using different materials depending on their location.
- As a class, discuss what would happen if architects didn't think about how possible extreme weather events could impact a town.
  - If architects can't make the buildings out of materials that can stay standing during a flood or find a way to keep the flood waters away, the buildings could fall apart and people could get hurt.

### Step 2: Activity Set Up (5 minutes)

- Explain to students that they will imagine they are architects who are in charge of building and testing a new structure that can stop flood waters from reaching buildings. The structure will be a man-made wall that is portable. This means when there is a flood, the wall will be placed in front of the building to block water. When there isn't flooding, the wall moves so it's not in the way.
- Provide students with Handout: Steps to Build Wall. As a class, read through the steps.
- Divide students into pairs or small groups. Provide each group with the following supplies:

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- Art supplies and building materials (some should be water proof)
- Large plastic bin or tray
- Tin foil
- Plastic wrap

## Step 3: Brainstorm Ideas and Build Prototype (35+ minutes)

- Explain to students that they will now design and build their wall. Make sure you think about these things as you design and build your wall:
  - It is strong and waterproof to stop flood waters from reaching the building.
  - It can move into place manually or automatically. For example, make your wall automatically move by pushing a button or pulling a lever, but you may have to explain and move your wall by hand during your demonstration.
  - When there is not water, your wall moves out of sight.
- As students are working, ask the following questions:
  - What part of your wall will make it strong enough to keep flood water out? (Answers will vary but students should be able to explain how their design won't break and can keep standing even if you push on it.)
  - How will people put your wall in place when a flood is coming? (Answers will vary, but students should be able to explain how their wall will be put in place manually or automatically.)
  - Where will your wall go when it's not being used? (Answers will vary, but students should be able to explain that their wall will move out of site. For example, it might go into the ground, up into an overhead storage or off to the side behind plants and trees.)

## Step 4: Test Prototype (15+ minutes)

- Explain to students that they will now test their wall to see if they can be moved into place and stop flood water.
- To test their walls, groups should follow these steps:
  - Place their wall in a the center of a plastic bin or on a tray.
  - Place something behind wall to represent the building the wall is protecting.
  - Slowly poor water into the plastic bin on the opposite side of the bin from the building.
  - Observe to see if any water gets past the wall and reaches the building

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- As students are testing their walls, ask the following:
  - What would happen if the flood waters were flowing faster than your test? (The wall might not be strong enough to keep the water away from the building, we'd need to build a stronger wall.)
  - What will happen if ocean levels keep rising and the flood water gets too deep? (The wall might not be tall enough to keep the water away from the building, we'd need to build a taller wall.)

## Step 5: Discussion (5 minutes)

- Have students present their flood walls to the class. As students present, ask them why every year more people need protection from flooding. Explain that as the Earth gets hotter, the increased thermal energy is causing more ice to melt. This is making the ocean levels rise and cause more flooding.
- After all groups have presented, discuss advantages and disadvantages of different designs and what groups would do in the future to change them.
- Have a concluding class discussion about why flooding is occurring. Discuss the following: As temperature of the Earth's surface rises, there is more thermal energy causing glaciers to melt. The water from the melted glaciers raises the level of the oceans. The higher ocean levels cause more flooding along the coasts.
- Extra Time?
  - Project this web address on a smartboard: https://www.floodsmart.gov/costOfFlooding/index.html
  - As a class, figure out the cost to repair damages in a school, home, or classroom based on the amount of water damage.

## Materials List

### Provided online:

- Video: Building Strong Structures
- Handout: Why More Flooding Will Occur
- Handout: Examples of Flood Walls
- Handout: Steps to Build Wall

### Not Provided online (each student or group needs):

- Art supplies and building materials (some should be water-proof)
- Large plastic bin or tray
- Tin foil
- Plastic wrap

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