Design to (Avoid) Disaster

Estimated Time: 40-60 minutes

SUMMARY

In this activity from the STEM Center's MOSAIC series, students create a tower that can hold a decorative "moon" at the top. This tower needs to stand at least 1.5 feet high and withstand a heavy wind so students will work with the materials available to them to meet those challenges!

WHAT YOU'LL LEARN

- Design engineering process.
- Weight distribution and forces.

Materials per Student or Team	**Materials for "Store" (as many as possible)**
● Golf ball (or other dense ball) ● Plastic cup (to fit ball) ● Paper for notes **Materials for Whole Group** ● Large square of cardboard ● Electric fan ● Ruler or tape measure	● Craft sticks ● Straws ● Paper plates ● Paper ● Masking Tape ● Scissors

WHAT TO DO

1. Establish the challenge for students: They will be designing a tower that needs to stand at least 1.5 feet tall and withstand both an earthquake and a windstorm. They have a sheet of paper to draw up their design, then they can go to the "store" to gather materials.
2. Students return and will begin constructing their towers. The cup should be at the top of the tower and hold the ball, which can't be taped or otherwise secured .
    a. It can be helpful to assign "roles" to students in a multi-student team to spread the work out evenly. The *architect* will be in charge of the design, the *structural engineer* will handle the materials, and the *city inspector* will make sure it meets objectives.
    b. A time limit can help prevent any one part of this activity taking too long. It's recommended to spend 5-10 minutes planning, 20 minutes for building, and (if time allows) another 20 minutes for a second prototype after testing.
3. When students finish their design, place it on the cardboard square. To test the design, subject the tower to the fan on low, medium, and high settings, then shake the cardboard around by sliding it back and forth on the table to simulate an earthquake. See which designs withstand these events!

TIPS

- This activity is easy to extend by introducing multiple rounds of design and testing. You can also introduce more environmental concerns such as rain (a spray bottle), hail

(throwing pennies), or temperatures (putting it in the sun or freezer for a while before testing again).

- Perhaps several groups are not feasible within the current social distancing requirements. Consider having a virtual competition, such as neighbors or relatives, with each team creating their own structure. Each design can be tested “live” using video chat or a socially distant gathering!
- For older students, resource management can become part of this activity by charging prices for items in the store. In this case, use coins or bills from a board game as a way to create a tangible budget and require that students fit their plans into this amount. Students (or teams) should get 25 coins and can purchase materials at the following prices.

Straw Bundle (5 straws)	1 Coin
Craft Stick Bundle (3 sticks)	1 Coin
Paper (2 pieces)	3 Coins
Tape (1 foot)	1 Coin
Paper Plate (1 Plate with Scissors)	5 Coins