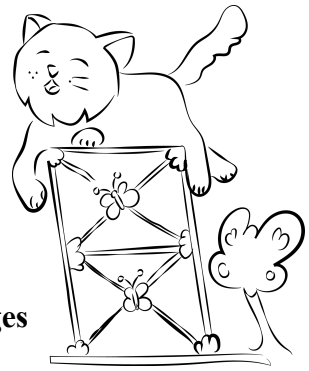
STEMTaught

Building with Barb
Earthquake Engineering Challenge



1. Watch Movie 1 to introduce the danger that earthquakes present and the need for earthquake-safe structures. **Read pages 283-292 of the text** to introduce to the students the reasons that earthquakes occur.
2. Watch Movie 2 to introduce earthquake-safe structures and bracing. **Read pages 293-300** of the text to define bracing techniques.
3. Watch Teacher Prep Movie Start Building! Introduce the building challenge and the materials that students will be using.
4. Watch Movie 3 to see braces in an actual building. **Keep reading and building.**
5. Watch Movie 4 to see a creative modern engineering solution for earthquake-safe structures (base isolators). Finish reading and building. Make a construction drawing with measurements. Have students think up what their building is for (ice cream shop, toy factory, business, hotel).
6. Use the Shake Table! Shake structures to failure. Have students analyze how their structure failed and journal about what they learned and how they could improve their design.

Materials: (STEMTaught trays help with passing out supplies)

- Straws (Start each group with 2 handfuls of straws. Have a materials station for students to get more as needed.)
- ½ of a box of paperclips per group
- Adhesive tape (students can tape joints so they do not come apart during the shake)
- Test tubes (3 per group full of water to add weight. Try weighting structures before the shake time as some adjustments and additional bracing may be needed.)
- 1 shake table (use heavy duty tape to secure each group's structure to the table)

Building

- Engineering groups of 2-3 students (Allow at least two different building sessions of an hour each; some teachers opt for more but at a minimum provide two hours for building.)
- Have students tape 3 test tubes full of water onto the middle/top of their building BEFORE they shake as they may need to reinforce their building more.
- Allow one hour for the shake day.

To survive an earthquake test, the building must not collapse for 10 seconds after the earthquake begins. Use the STEMTaught metronome to practice clapping at different speeds to simulate the earthquake's intensity. The teacher calls out the earthquake magnitude and can increase the intensity as time goes on in the test.

Hints and tips:

- Structures do not have to be a full straw length; students can trim their vertical and horizontal straws so that they can utilize a full straw for their diagonal cross members. Get creative and have fun designing.