Earthquake in a Box

Lab Related Activity: *Engineering for Earthquakes*

The Tech Museum of Innovation
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This activity is meant to extend your students' knowledge of the topics covered in our Engineering for Earthquakes lab. Through this activity, your students will see first-hand how tectonic plates interact and the consequences.

Grade Levels: 5-8
Estimated Time: 45 minutes

Student Outcomes:

1. Students will be able to build and use a model to demonstrate tectonic plate movement and the resulting land mass changes at divergent and convergent plate boundaries.

Next Generation Science Standards
Earth Science **Grades 6-8:** MS-ESS2-2
Science and Engineering Practices-Developing and using models to describe phenomena
Common Core ELA Standards
Grade 5: *Speaking and Listening* 5.SL.1b-d
Grades 6-8: Writing W.7; *Speaking and Listening* SL.1b-e

California State Science Standards
Earth Sciences:
Grade 6: 6.1.c-e
Investigation and Experimentation:
Grade 5: 5.6.b-c, g-h;
Grade 6: 6.7.a, d, e; **Grade 7:** 7.7.c-e
Grade 8: 8.9.a-b

Vocabulary

Familiarity with these terms and concepts will enhance students' experience in the activity

- Convection current: the movement of the mantle. It brings the hot mantle toward surface, where it moves laterally and then falls when cool. Hot mantle replaces it. This cycle moves the crust.
- Convergent plate movement: Area where plates are moving toward each other.
- Divergent plate movement: Area where plates are moving away from each other.
- Earthquake: A shaking of the ground caused by the sudden movement of the earth's crust or by volcanic activity.
- Plate tectonics: A geological model in which the Earth's crust and upper mantle (lithosphere) are divided into a number of segments (plates) which move in response to convection currents from the lower mantle (asthenosphere).

Materials:

- Medium cardboard box
- 3 sheets of 8.5"x11" paper
- Scissors
- Tape

Procedure:

1. Students will work in groups of four for this activity. Each group of students will receive one set of the above materials.
2. Cut a narrow slit in the top of the box. The slit should be no more than one centimeter wide and should be about nine inches long.
3. Cut a square hole in the side of the box large enough that your hand can fit through easily. The hole should be centered with the slit in the top of the box.
4. Slide the two pieces of paper through the slit in the top of the box so that half of each sheet is inside the box. You should be able to see and reach them through the hole in the side of the box.

*Step 2

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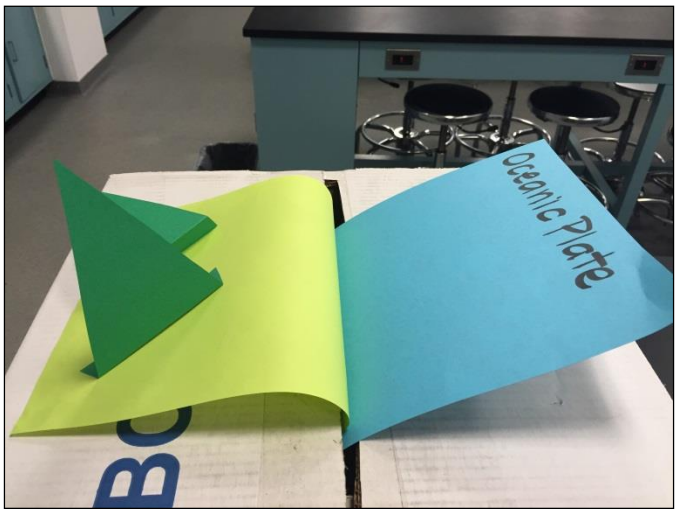
5. Take the piece of cardboard that had been cut out for the hole and fold it in half so that it looks like a triangle. Tape this to the outer edge of one sheet of paper so it looks like a mountain.
   - Label the cardboard *Continental Crust.* It should rise above the ocean crust (the paper below).
   - Label the sheet of paper the cardboard is taped to *Ocean Crust*.
   - Label the other sheet of paper *Oceanic Plate*.
6. Take the third sheet of paper and add another piece of cardboard to one end and label this paper *Continental Crust*.
7. *Discussion:*
   - How can the earthquake in a box be used to model an earthquake at a convergent plate boundary? A divergent plate boundary?
   - How would these types of earthquakes affect the land masses? What be the resulting land mass if there is one?
8. *To demonstrate an earthquake at a divergent plate boundary:*
   - Place your hand in the box and push both sheets of paper up from inside the box.
   - *Discussion:*
     - What is happening to the oceanic crust? The oceanic plate? The continental crust? Why?
     - What does the previously unseen paper that is now being pushed out of the box represent?



9. *To demonstrate an earthquake at a convergent plate boundary:*
   - Place one hand in the box and pull the ocean crust paper downward. Use your other hand to push the continental crust paper towards the slit on top of the box.
   - *Discussion:*
     - What is happening to the oceanic crust? The oceanic plate? The continental crust? Why?
10. Try switching out the oceanic plate paper for the other continental crust paper. Test again to see the results.

Extended Learning

- Students should use the earthquake box to re-create real-life earthquakes. Students should demonstrate what happened and the results and share with the class.
- Structural engineering could be added by having students create small structures using toothpicks and glue and placing the structures on one of the paper "plates." Their structures could then be tested in their model earthquake.