# 2.1.2 Crust Construction and Destruction

## Overview

On the scale of geologic time, there has been tremendous movement on the Earth's surface. Oceans have opened up where they once did not exist. Mountains have risen from sea level. Continents have broken apart and moved locations. Volcanoes have erupted and laid down layers of lava. And yet, the size of Earth has not changed. When Earth's crust expands in one location, there is an equal and opposite contraction in another location. Geologists know that new crust is made when molten basaltic rock rises up in the cracks of oceanic crust where the sea floor is spreading. Far away, at the edge of the oceanic crust, the spreading crust meets resistance as it hits thicker continental crust. The battle of the two crusts at this location results in a subduction zone, where the thicker continental crust overruns the expanding, thinner oceanic crust. As it is overrun, the oceanic crust melts and creates hotspots that cause volcanic activity under the edge of the continental crust. Thus, the crust of the Earth gains and loses area in a constant dynamic of construction and destruction.

## Learning Objectives

- The Earth's plates move in ways that both create new crust and destroy old crust.
- Major tectonic activity on Earth's surface, such as earthquakes and volcanoes, are related to the associated movements found at divergent and convergent plate boundaries.

## Student Activity: Crust Construction and Destruction

## Materials

For every 8 students:
4 desks or tables
2 pieces of butcher paper, 3 feet long each and as wide as the desks/tables
2 pieces of foam board cut to the size of the desks/tables
Colored markers
Tape
Access to map

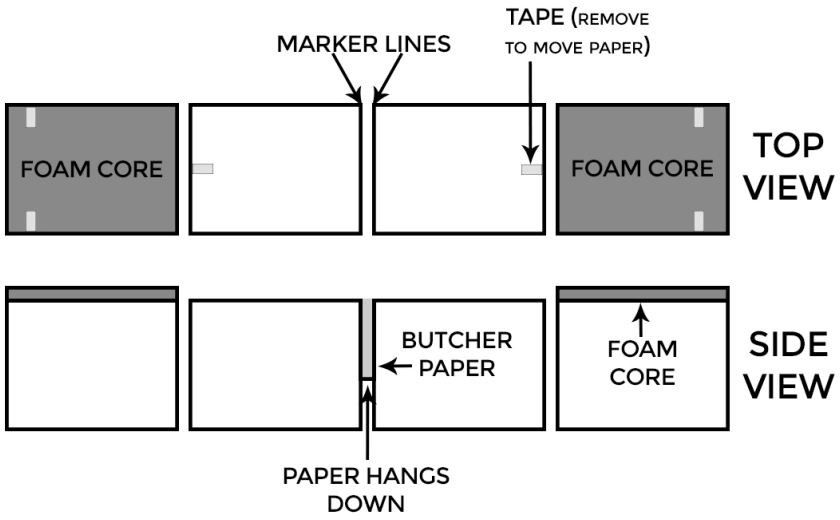
## Advance Preparation

This is a whole-class activity.
Divide into teams of 8 students. Gather materials.
Determine whether you will use hard copies or computer access for the map in step 9.

## Process and Procedures

1. Set up the investigation by doing these things:
    - Place all four desks in a row. Leave a small space between the two center desks (see diagram).

- Lay two pieces of butcher paper across each of the two center desks. The paper will be too long, so let the extra length of paper from each desk drape down in the center space between them. Lightly tape the other end even with the far edge of the desk as shown.
- Lay the remaining two pieces of foam board across the outer two desks. Lightly tape the foam board on the sides to hold it in place. Have the edge of the board towards the center desks line up even with the edge of the desk, just touching the edge of the paper from the center desk.




2. Using the same colored marker, draw a line across each of the two pieces of butcher paper at the point where they each drape down into the center space. Your lines will be nearly next to each other.

3. Next, place four students on one side of the row of desks and 4 students on the other side. All students should actively perform the task of moving the papers and/or taking care of the foam board in step 4.

4. Carefully loosen the tape that holds each of the center desk papers to the edge of the desk. Then, holding the paper by the sides, begin moving each paper on the center desks AWAY from the center slowly. See what happens to the lines you made with the markers.

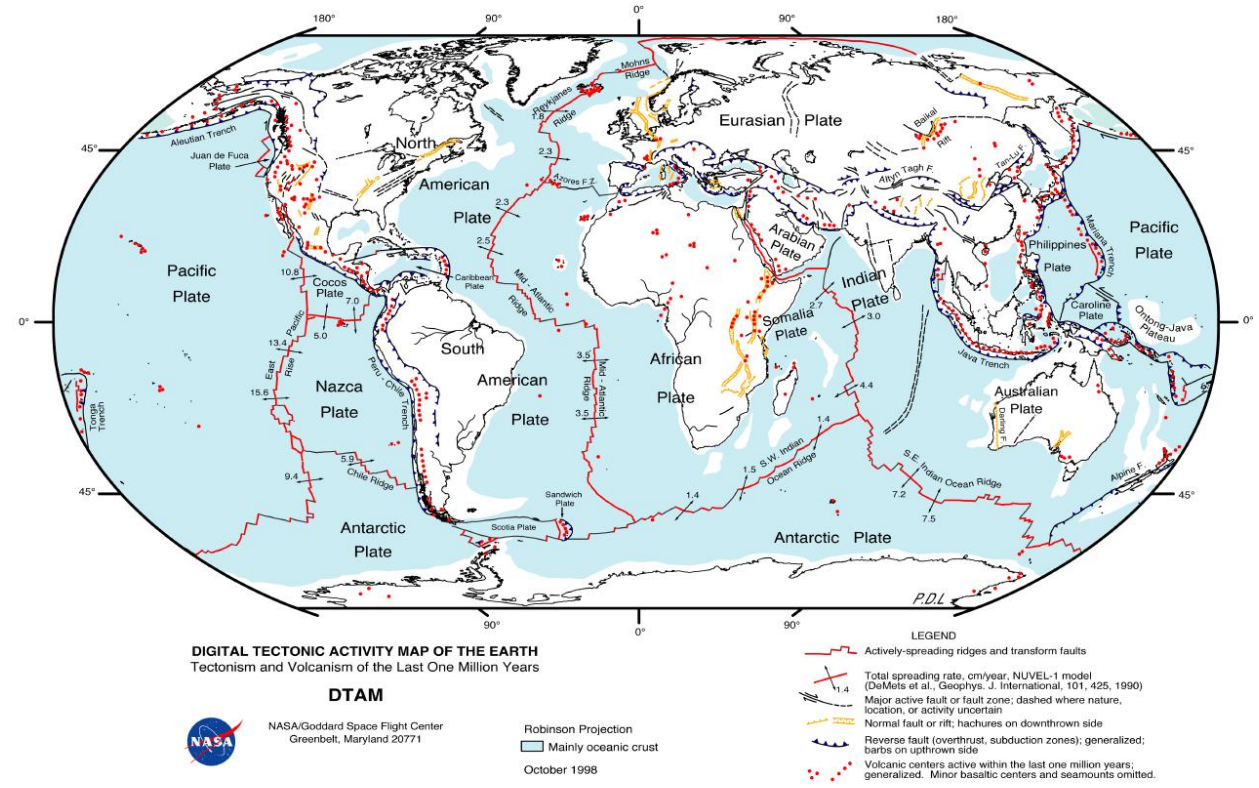
5. Stop and make new lines to either side of the center gap using a new colored marker.

6. Continue moving this way several more times, but note what is happening to the boundaries of the butcher papers as they approach the foam core boards on the outer desks. What can you do to keep things moving smoothly?

7. Continue moving until you no longer have enough paper draping in the center gap. Use tape to hold the butcher paper in its new position so that you can discuss the investigation with your team.

8. Answer the following questions with your team:
    - Identify what the butcher paper and foam core board represent. Why were they made of two different materials?
    - What major geologic activity were you simulating?
    - What did your marker lines represent? What did you notice about the pattern of the lines at the end?
    - What happened at the boundary between the paper and the foam core board as the paper moved? You made a decision in step 6. Why did you do that? Did you do the same thing as other teams? Was your solution for this boundary based on real life?

9. Access the map pictured below via computer or with hard copies prepared in advance. What do you notice about the pattern of plate boundaries, volcanoes, and earthquakes? How would the decision you made about the interface between the butcher paper and the foam board (step 6) explain this pattern?

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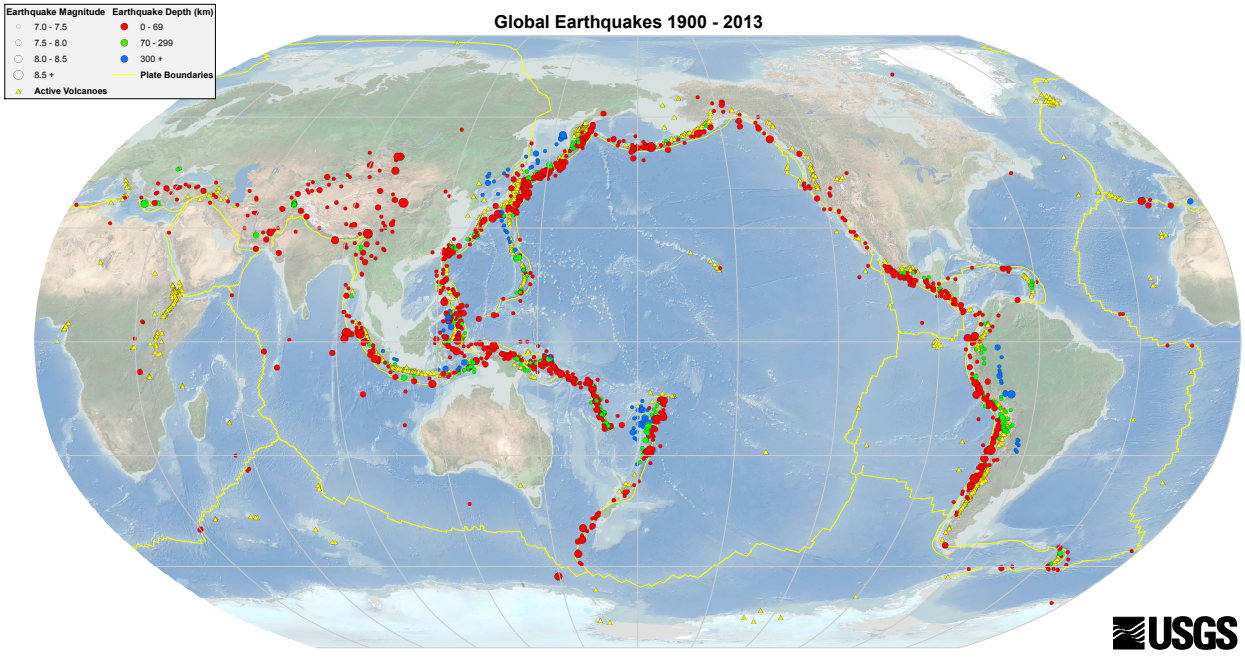

## Assessment

Write an explanation for the following statement using examples from your experience with the investigation above.

*The geologic processes on Earth follow the Law of Conservation of Matter, where matter is neither created nor destroyed but merely rearranged. Even though there is a great deal of tectonic activity on Earth, no net gain or loss of rock material occurs.*

## Expected Outcomes

**What's the take-away?**

On the scale of geologic time, there has been tremendous movement on Earth's surface, yet the size of Earth has not changed. The processes that form crust and destroy crust can be modeled and observed. Models can be used to identify patterns and predict future movements.

**What does the student work product look like?**

Whole Group Activity: Crust Construction and Destruction Model

Student groups should be able to identify what each part of the model represents and the processes that are being simulated. The excess hanging butcher paper that rises out of the space between the desks represents the molten basaltic rock that rises under the oceanic crust of the seafloor. This action represents how the new crust is constructed. As the oceanic crust (the butcher paper) collides with the thicker, more dense continental crust (the foam board) the oceanic crust crumbles or slides under it. This shows the beginning of the destruction process.

Assessment

Individual student responses should reflect the learning gained during conversations. In the group activity. Written explanations need to connect the modeling activity with the geologic processes that form and destroy Earth's crust.