PLATE TECTONICS ACTIVITY

The purpose of this lab is to introduce the concept of plate tectonics and the formation of mountains. Students will discuss the properties of the earth’s crust and plate tectonics. Students will use clay to model different types of crust and plate activity.

Materials:
World map or globe
Clay for each student

Invitation and Sharing Prior Knowledge

1. You are about to begin a unit on geology. Can anyone tell me what geology is? The study of the physical earth I.

2. Hold up a world map or globe. What is the Earth’s outermost layer called? The crust.

3. Can you name any really impressive features that we can observe on the crust (mountains for example)? Valleys, continents, islands, canyons, volcanoes, etc. (if they say forests, ice caps, cities, etc. (Remind them that the crust is just the rocky layer and soil)

4. Has anyone been to visit any places that they thought were really impressive geologically? Discussion.

5. So, does the crust continue under the ocean? Yes—oceanic crust is under the ocean and continental crust makes up the continents.

6. What can you tell me about the thickness of the crust? Is it the same everywhere? No—the oceanic crust is much thinner than the continental crust. The crust is many km thick but is thin relative to the rest of the planet. The crust is like the skin on an apple.

7. What is beneath the crust? Mantle (draw diagram w/ inner and outer core)

8. Do you think the crust has always been the way it is now? (No)

9. Why do earthquakes occur? Why do volcanoes occur? These are some questions we will try to answer in our study of geology.

Exploration

Give each student enough clay to make two pancakes and have a little left over. Use the same color, so that this clay may be reused. Have them go ahead and make the pancakes.

1. Your clay pancakes will represent tectonic plates on the Earth’s crust. We are going to pretend that they are moving over a molten mantle. What are the crust and the mantle made out of in real life? Rocks
2. How can rocks be moving like butter in the mantle? They are molten because they are under extreme heat and pressure.

3. What would happen to those mantle rocks if they made it to the much cooler surface of the earth? They would harden and crystallize to form the rocks we are familiar with.

4. So new can crustal rocks form when mantle material comes to the surface? Yes.

5. Ok, can you think of any places where molten mantle rock is coming to the surface? Hot spots, volcanoes—discuss later. Mid ocean ridges (or spreading centers)

6. What happens at the mid ocean ridge? The crust spreads.

7. So if our two pieces of clay are oceanic crust, and where they meet is a spreading center, how would these plates move? Away from each other

Show me with your clay.

8. If they move away from each other, what happens at the ridge? New mantle material rises and attaches to the edge of the plate. When it cools it forms new oceanic crust.

9. How would that work with our clay? We would have to attach new clay to the inside of our plates (near the ridge). As we keep spreading we would continue to make more and more oceanic crust.

Draw spreading center boundary on board:

10. Can you think of any place in the world where there is a spreading center? Mid Atlantic Ridge, East Pacific Rise, Pacific-Antarctic Ridge, Southeast Indian Ridge, etc.

11. Is there any other kind of crust besides oceanic? Continental crust.

12. How would continental crust look compared to oceanic crust? Would it be as thick? Yes. Continental crust is what we are used to seeing and it is about 60 km thick. Oceanic crust is only about 5-10 km thick and is very dense.

Draw continental and oceanic crust on board (out of the way—keep other drawings together):
13. If it were to rain, where would the water go? *It would go to the lowest spot. Because the oceanic crust is thin and dense, the lowest areas on the surface of the earth are areas of oceanic crust. The rainwater drains down, becomes rivers, and collects in these ocean basins. So the geology tells us why the oceans are where they are!*

Ok, back to our clay…

14. We’ve seen one way two plates can move—away from one another. What is another way they can move? *Towards each other*

15. So move your plates toward each other. What can happen when they meet? *They crumple up.*

16. If they were crust and they crumpled up, what would they be making? *Mountains*

**Draw collision boundary:**

Mountains

17. Can you think of any places on the earth where this has happened? *Alps, Himalayas, Andes, Appalachian Mountains, etc.*

18. Sometimes if one of the plates is oceanic crust, it can slide under the other plate. Does anyone know what this type of boundary is called? *Subduction boundary*

19. Can you think of any subduction boundaries? *Peru-Chile Trench (off the west coast of South America), Middle American Trench (off the west coast of Mexico), Mariana Trench (in the west Pacific Ocean), many others*

One plate subducts, or slides under the other. You can still get mountains where the plates meet. **Make a subduction zone with your plates.**
20. Now, as that plate goes down, it sinks into the mantle. What is the temperature of the mantle like, generally speaking? \textit{Hot!}

21. So what would happen to the down-going plate? \textit{It can start to melt.}

22. When it melts the molten rock can rise and explode through the crustal rocks above it. Can anyone guess what forms when molten rock explodes up through the crust? \textit{A volcano.}

\textit{Add volcano to drawing:}

23. Ok, so plates can move apart and can move together. Can they move any other way? \textit{They can slide past one another.}

Make your plates slide past one another. This is called a transform boundary. The other plate boundaries we drew from the side, but this one we will look down on. This drawing is from the top.

\textit{Draw a transform boundary.}
24. Can you think of any transform boundaries? *San Andres fault in southern California, many other small ones.*

25. Can you think of an event that happens along transform boundaries—something California is famous for? *Earthquakes. As the plates slide past one another, they stick together and grind, causing earthquakes.*

**Concept Introduction**

Ok so what are the 3 ways plates can move? *(Make chart)* And what types of boundaries are formed for each type of movement? *(Add)* Can you think of any landform or features associated with each type of boundary? *(Add)*

Chart

<table>
<thead>
<tr>
<th>Away</th>
<th>Spreading boundary</th>
<th>Mid ocean ridge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toward-----</td>
<td>1. Collision boundary</td>
<td>Mountains</td>
</tr>
<tr>
<td></td>
<td>2. Subduction boundary</td>
<td>Volcanoes</td>
</tr>
<tr>
<td>Past-------</td>
<td>Transform</td>
<td>Earthquakes</td>
</tr>
</tbody>
</table>

**Application**

1. Do you think you could ever have earthquakes at other plate boundaries besides just transform? Which ones? *Yes—collision and subduction*

2. Has anyone ever heard of a volcano that is not at a plate boundary? *Hawaii arch—hot spot— we will talk more about this at another time*