Modeling Mountains Progam Outline
Rocky Mountain National Park
Andrea Johnson

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Modeling Mountains

Theme

The story of the Rocky Mountains extends beyond the boundaries of Colorado.

Goals

The students will…

- Understand that the Earth is made up of plates.
- Understand how the movement of Earth's plates created the Rocky Mountains.
- Appreciate that the landscape we have is because of plate tectonics and without it the land would look like Kansas.

Objectives

The students will be able to…

- Create their own hypothesis about how the Rocky Mountains were formed.
- Describe the process of the Pacific Plate going beneath the North American Plate.
- Identify what happens to the metamorphic, igneous, and sedimentary rocks in their model.
- Predict what the park would look like without mountains.

Time

45 minutes

Location

Classroom

Grade Level

6th grade

Note: This activity is designed to be used after a lesson on tectonic plates, though it is written as if the students have to rely on their previous knowledge. This lesson is also a pre-cursor to a field trip to Rocky Mountain National Park.

Preparation

Make or buy play dough (need at least three different colors). Hard boil 2 eggs and color them to look like the earth (make crack in one). Gather cardboard pieces, and cut into small pieces.

Engage (10 min)

Show the students a picture of the Rocky Mountains. Ask the students to think about how the Rocky Mountains were formed and how do we know this. Have a few students share their ideas.

Inform the students that they will be creating a hypothesis as to how the Rocky Mountains were formed. Ask students to explain what a hypothesis is. Students' answers may vary, but should be directed towards a hypothesis being an educated guess. Explain to the students that an educated guess needs to be reasonable (something that can actually happen). Share with the students a poor example (e.g. a goblin scooped up a pile of rocks which are now the mountains).

Have students write down their hypothesis. Ask for volunteers to share their educated guess.

Ask students how they could test their hypothesis. Students may respond with 'experiment' but lead them in the direction of using a model. Explain to the students that a model is a small-scale representation of a larger, more complex thing.

Explain (7 min)

Show students a cracked hard-boiled egg and a smooth hard-boiled egg. Ask the students to think about which egg best represents the Earth and why. Students should respond with the cracked egg because the Earth is not a flat surface, there are mountains, valleys, etc. Students, if they have the background knowledge, may also include that the Earth is made of tectonic plates.

Inform the students that the cracked egg is a good representation of the Earth because it is made up of many pieces called plates. Explain to the student that a plate is made up of the Earth's lithosphere, which includes the Earth's crust and upper part of the mantle (aesthenosphere).

Show the students a map of the tectonic plates and explain that there are three plates involved in building the Rocky Mountains: the Eurasian, North American and Pacific Plates.

Materials

- Play-dough (3 colors)
- Tarp
- 4-6 small pieces of cardboard (approx. 3”x6”)
- 2 hard-boiled eggs colored to look like the earth, one cracked.
- Basalt and granite rocks, roughly the same size.
- Map of Tectonic Plates.
- Image of Kansas landscape.

State Standards

Sixth grade

Science
Earth Systems Science: 1 a., 1 b.

Ask the students to look back at their hypotheses and incorporate tectonic plates in to them. As the students are modifying their hypothesis, have them include how the plates are creating mountains in the middle of the North American Plate. Ask for volunteers to share their updated hypotheses.

Prepare to Explore (7min)
Tell the students that they will be creating a model of tectonic plates in small groups. Show the students the set-up of the model before they try it on their own.

Explain that each group will receive a Eurasian Plate and a Pacific Plate. The Eurasian Plate and Pacific Plate are both represented by cardboard. The cardboard represents an igneous type of rock called basalt which is the main rock forming oceanic plates.

Tell the students that the North American Plate will need to be assembled using play-dough. The North American Plate is made up of all three rock types because it is a continental plate. Ask the students what the three rock types are. Students should respond with igneous, metamorphic, and sedimentary. Demonstrate the process of laying play-dough in layers to represent the igneous and metamorphic rocks. Show students that to represent sedimentary rocks they will sprinkle play-dough pieces on top of the other two rock layers because the sedimentary rocks are made up of pieces of other rocks and are easily broken apart.

Inform the students that they will need to set up their tectonic plates so that the Eurasian Plate in on the right (East), the North American Plate is in the middle, and the Pacific Plate is on the left (west).

Explain to the students that the rocks between an oceanic (Pacific) and a continental plate (North American) are different. Pass around a sample of basalt and a sample of granite that are approximately the same size. Ask the students what is different about the two rocks besides their color. The students should respond by telling you that the basalt rock is heavier than granite. Using the idea of density ask the students what they think might happen if a heavier plate met up with a lighter plate. The students should be able to determine that the heavier plate will go under the lighter plate.

Break the students in to small groups (3 students/group) and hand them their materials.

Explore (15min)
Students will be manipulating their model in small groups. Remind students to make observations about what happens to the different rock types (igneous, metamorphic, and sedimentary) as they move the tectonic plates.

Once the students are done manipulating their model have them clean up their area.

Explain (6 min)
Have the students discuss their observations. The student's response should include, but are not limited to: one plate going under the other one, they see a rise in their North American Plate, and sedimentary rocks are falling off. Ask the students what the rise in the North America Plate represents. They should respond with Rocky Mountains. Ask the students what happened to the sedimentary rocks that fell off. Students may have different thoughts on this, but lead them to the idea that the sedimentary rocks were eroded away as the mountains rose, and now they make up the sedimentary rocks on the plains of Colorado, Kansas, and Nebraska.

Have the students go back to their hypothesis and modify it one more time. Have volunteers share what they changed. The students should now be aware that the Rocky Mountains are formed by the movement of tectonic plates. The Pacific Plate, because it is denser, is moving underneath the North American Plate. As the Pacific Plate moves underneath it begins to push up and the North American Plate begins to compress. As the Pacific Plate slides further under the North American Plate, the middle part of the continent begins to rise (and some volcanism occurs) creating mountains.

Elaborate (2 min)
Ask the students what they think Rocky Mountain National Park would look like if we didn't have any tectonic plates moving around. The students should realize that there would be no more mountains. Explain to the students that the park may look like Kansas and hold up a picture of Kansas.

Conclusion (3min)
Tell the students that just because they can't see a process happening, it doesn't mean that they can't understand it or that it isn't occurring. By using a model, the students are able to figure out how the Rocky Mountains were formed. Inform the students that as they venture up to Rocky Mountain National Park, they will need to keep their eyes open for signs that the mountains were folded and pushed upwards.