6th Grade – Masters of Models

(Constructive and Destructive Earth's Processes)

Class Description
Students will model mountain building, stream erosion and flash floods using sandboxes.
Location: Devils Kitchen Picnic Area
Duration: 30-45 Minutes

Standards Addressed:
Science 3.1 *Complex interrelationships exist between Earth's structure and natural processes that over time are both constructive and deconstructive.*

Enduring Understandings/Essential Questions

Natural Earth processes have changed, and will continue to change, Earth's surface features over time.
Models are used in science to study processes that are difficult to observe directly.
How do forces inside Earth and on the surface build, destroy, and change Earth's crust?
How do constructive and destructive forces interact in cycles to change Earth's surface over time?

Vocabulary Addressed

Constructive
Destructive
Weathering
Erosion
Sediments
Mechanical weathering
Chemical weathering
Models
Cycle
Uplift
Mountain building
Rock cycle
Sedimentary rock
Igneous rock
Metamorphic rock
Layers of the Earth (crust, mantle, outer core, inner core)
Evidence

Theme, etc.

Theme: Uplift and weathering and erosion have all contributed to the landscape of the Monument. We can model these processes to see their effects.

Objectives:
-Students will be able to identify the Redlands fault as evidence of uplift.
-Students will be able to construct a model, demonstrating uplift, continual stream erosion and flash floods.

Major Concepts:
-A fault is evidence that the earth's crust has moved, uplifted. (rock layers don't match up)
-Weathering and Erosion have shaped the landscape here: flashfloods contribute to carving the canyons.

If time to hike to top of hill:
Pre-Intro:
People come to visit Colorado National Monument from all of the country and all over the world to see the amazing red colored rocks and canyons. We are fortunate that it is in our backyard, but did you ever ask yourself why does the landscape look like this here…why can we see tall red cliffs here but not around Main St. Grand Junction, or by the mall, or near your school?

As we take a short walk to get a good view of the whole valley, look for evidence of uplift, weathering and erosion.

If no time to hike:
Intro:
People come to visit Colorado National Monument from all of the country and all over the world to see the amazing red colored rocks and canyons. We are fortunate that it is in our backyard, but did you ever ask yourself why does the landscape look like this here…why can we see tall red cliffs here but not around Main St. Grand Junction, or by the mall, or near your school?

From top of hill, or from picnic area/parking lot area:
Millions of years ago, forces deep within the earth uplifted the major part of Colorado National Monument. What evidence of uplift can you identify?
Can you see any angled rocks around here?
Look at angled rocks – compare to mostly horizontal layers of the cliffs.
Rocks forced at an angle or rocks layers that have moved and are displaced (mis-matched) are evidence the crust moved. This is known as the Redlands fault.
Show Photos of Redlands Fault.

Fault Foam Model *(use students to help you hold model.)*
This simple model can help us see what happened here at the Redlands Fault.
(40-70) **Millions** of years ago, when forces deep within the earth caused the area that is the Monument to **uplift**, some rocks bent and some rocks broke creating the **Redlands Fault**.

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(The angled rocks need to be explained on the model- the top grey bit of the lower section, peeled back.)
Weathering and Erosion have since broken down and removed a lot of rock.
(Remove middle piece of foam model.)

After the Uplift
This foam model helps us visualize the uplift and fault, but it doesn't explain how the canyons were carved. You are going to make a model to simulate canyon carving.
(hike back down if at top of hill)

Sandboxes 7-10 *x students per model.*

First: You need to model the uplift so that part of the sand (half the box) is uplifted above the rest. *(Might need rocks underneath uplifted end of box to create a gradient for water to run.)*

No we are going to model different kinds of erosion and compare them. So think about forces that can erode a landscape and use the different "tools" to model them. Discuss in your group before you do any modeling.

Comparsion Discussion: *Points to help students see:*
Have students offer up what forces of erosion they modeled and what tools made a good model. How did the different forces effect the landscape? Did they all move the same sized sediment? Were the channels created the same shape? Etc.

Clean-up
Need to carefully pour water off sand, but not pour sand out.

Wrap-up
Look for evidence of these processes on your hike.
What evidence of floods did you see on your hike?

Extras
This model gives us an idea, scientist use controlled measurable larger experiments to base large models and calculation on – like the senior thesis of Red Canyon **(Photo prop)**

Extra filler (text from exhibit) about the canyon model if need…….

As the Colorado River incised the Grand Valley, small tributary streams from the Monument, which are usually dry, struggled to keep up. Over the millennia, these streams eventually cut down through the sandstones to create dramatic steep-walled canyons. When the stream beds reached the hard igneous and metamorphic rocks, downward erosion almost stopped allowing rock falls and other processes to widen the canyons. Meanwhile the Colorado River continued its relentless downward erosion, leaving behind the hanging canyons of the Monument.