**GYSTC Fifth Grade Lesson**

Unit: Constructive and Destructive Forces

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| **Title of the Lesson:** Constructive & Destructive Processes**Estimated Time:** 3-4 days |
| **Standards:**  **S5E1. Obtain, evaluate, and communicate information to identify surface features on the Earth caused by constructive and/or destructive processes.**1. Construct an argument supported by scientific evidence to *identify surface features* (examples could include deltas, sand dunes, mountains, volcanoes) as being caused by constructive and/or destructive processes (examples could include deposition, weathering, erosion, and impact of organisms).
2. Develop simple interactive models to *collect data* that illustrate how changes in surface features are/were caused by constructive and/or destructive processes.
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| **Science and Engineering Practices**  | **Crosscutting Concepts**  |
| **Developing and Using Models** Develop a model using an analogy, example, or abstract representation to describe a scientific principle or design solution.**Planning and Carrying Out Investigations** Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution.  | **Energy and Matter** Energy can be transferred in various ways and between objects. **System and System Models**A system is a group of related parts that make up a whole and can carry out functions its individual parts cannot.  |
| **Big Ideas/Enduring Understandings:*** The result of various forces acting on the Earth’s surface cause Earth materials change slowly over time
* The surface of the Earth is constantly in motion
* The top layers of the Earth (or crust) is divided into giant plates that move very slowly on top of the next layer down (or mantle)
* Constructive processes (deposition, impact of organisms) create unique surface features (examples could include deltas, sand dunes, mountains, volcanoes)
* Destructive processes (weathering, erosion, impact of organisms) create unique surface features (examples could include widening rivers, shrinking beaches, glacial valleys)

**Essential Questions:**How will the Earth continue to change over the next thousand years? How does water change the Earth’s surface?How does wind change the Earth’s surface?How do the layers of the Earth impact its surface? | **Vocabulary:**Surface featuresconstructive processdepositiondestructive processearthquake erosion faultvolcanoweatheringdeltasand dunemountainimpact of organisms  |
| **Materials:**Chart paperStudent journals*The Restless Earth or Magic School Bus Blows It’s Top*Computer and LCD projectorConstructive Forces graphic organizerDestructive Forces graphic organizerConstructive and Destructive PPTFor each group of students you have in your room:Plastic tub with ½ inch hole in one end and a rubber stopperSandPebbles/gravelSmall RocksSmall stick & Gallon jugWater in a container for easy pouring |  **Safety Considerations:**When working with sand, pebbles, small rocks, and water make considerations for students who are using them. Have plenty of space and safety goggles when necessary.  |
|  **Technology Integration:** PHASE II |
| **Engage:** As the students how many earthquakes they believe have occurred in the US this week? Have everyone make a prediction, then show them the geological activity map found at: <https://earthquake.usgs.gov/earthquakes/map/>How do earthquakes shape the earth?As additional openers/hooks, choose one or both of the following activities to introduce students to constructive and destructive processes and the resulting surface features.Guess the force Activity: Have students view Constructive and Destructive PowerPoint. As you show each slide of the PowerPoint presentation, ask students to predict and write in their science journal (so you can revisit their predictions at the end of the unit) what force caused the formation shown. Share their predictions.Literature Connection Activity: Read *The Restless Earth* or *Magic School Bus Blows It’s Top*. Other books may be substituted that include constructive and destructive forces at work. After each page, ask students to name **the forces named in the book.** Create a word splash on chart paper.Have the students write the words. Students sort the words into categories. (One method to do this is to use a half size poster board and a sticky note for each word. Arrange the sticky notes under the category name on the board.)Discuss the various categories within the class by students justifying their reason for choosing their category. (This is getting students ready to construct an argument based on evidence)Have small groups of students complete a short CER Framework to construct an argument that justifies their various categories from the book. |
| **Explore:** **Day One:**Play *Scratch* using the prompter “Things connected to Construction or Destruction”. Give the students 5 minutes to write anything and everything they know about the words construction or destruction and then count how many responses they wrote. The student with the most thoughts reads them aloud, letting any student who has the same answer yell out “Scratch”. Everyone with that answer crosses it out until all the thoughts are read. If another student still has additional thoughts that were not called, they read theirs until all students’ thoughts have been said and either crossed out or left circled.Watch the You Tube Video Surface Formation <https://www.youtube.com/watch?v=QnERE1F-MCM>Fill in the constructive and destructive graphic organizers. Then have students look at the two organizers and create a similarity/difference t-chart.Have partners complete a CER Framework to support the claim that a constructive force can also act as a destructive force depending on the situation. For example, water can wear down the land or deposit soil at the end of a streambed. Make sure students use evidence from the video to support their claims. They can use the notes from their graphic organizers to assist. A simple explanation of CER framework can be found here: <http://www.activatelearning.com/claim-evidence-reasoning/> **Day Two-Sand Dune Experiment**The following activity can be conducted as a class demonstration, or by students in small groups. Arrange sand in a medium sized plastic tub. Make it smooth. Using a hair dryer on low setting, blow the sand in various directions to create and demonstrate how sand dunes are created and can change. Model for students how to measure the changes in the dune with a vertical ruler in the sand (it may be helpful to tape it to the side of the plastic tub). Teacher can decide whether to use standard or non-standard units of measure. Record the changes on a class chart in the first box. Discuss the impact of wind on the landscape.Using a stick, tell the students that it represents a tree in the landscape. Place it in the tub and blow the sand. Measure what differences occur with the tree in place. Record on the class chart under “With Tree” heading.Repeat with the demonstration using a pile of rocks. Measure what differences occur with the rocks in place. Record on the class chart under the “With Rocks” Heading.In their journals, have students complete a CER Framework to construct an argument to answer the question “What affects the movement of the landscape?” (Ex: I think that wind impacted the landscape…)**Day Three- Riverbed Experiment**Gather the following supplies for each group of students you have in your classroom: One plastic tub with a ½ inch hole at one end and a rubber stopper to keep water in the tub, a two gallon bucket, sand, pebbles, various rocks and sticks from outside and a gallon jug of water. Demonstrate how to perform the experiment. Arrange the sand, pebbles, rocks, and sticks in the tub to form a land mass featuring a cliff with the empty space on the side of the tub with the hole. Then place the tub at the end of a table with the hole extending over the edge. Place the bucket on the floor so that it will catch the water as it flows out of the tub. Have students sketch their original formation before letting the water stream out for a minute. In a steady stream starting at the end of the tub away from the hole, start pouring the water slowly and continue for one minute. Don’t forget to remove the stopper from the hole so the water can pour into the bucket. This demonstration should create river bed with a delta formation at the end. Discuss with the students observations they had during the experiment. Pay close attention to the impact of the pebbles, rocks and sticks. At the end of one minute, have student volunteers measure the length and width of the delta and record in their journals. They will do the same measurement at the end of the next test. Also, have students sketch their observations at the end of one minute.Have each group of students perform the same experiment pouring the water for one minute. Have them draw their riverbed in their journal, record their data, and then drain all water from the tub.Have students make a claim in their science journals about what forces created the deltas in the Riverbed experiment. In addition, students need to support their claim with the evidence and data from the experiment. Have groups of students discuss and dispute the claims of other groups in a discussion roundtable. |
| **Student Action/Expectations:**In small groups, have students justify their claim and support it using evidence from their experiment. These simple interactive models of a riverbed allow them to collect data on the impact of water and deposition.  In addition, students explore what forces are constructive and destructive by categorizing them and then using graphic organizers to define and provide examples. As needed, emphasize that constructive forces are forces that create or build something on the earth. Constructive forces affect the earth's surface by building it up through the formation of new crust and/or landforms like mountains, islands, deltas, and sand dunes. But, while constructive forces are creating new landforms on the Earth, destructive forces are simultaneously wearing them down. Tornadoes, hurricanes, volcanoes, tsunamis, earthquakes and human impacts are examples of destructive forces that tear down or wear away parts of the earth. Weathering and erosion are two additional destructive forces that are constantly acting to reshape the land.  Weathering is the breaking down of the materials of Earth’s crust into smaller pieces.  Erosion is the picking up and carrying away of these pieces.    |
| **Elaboration:**Have each group build a second cliff structure in their tub and pour water for three minutes. Students should draw the second riverbed in their journals, measure the length and width, and record their data. Have students discuss  |
| **Evaluation:**Have students return to their recording sheet for the *Scratch* activity on day one. Have students work for one minute to add as many new words as they can to their page. Review words in the same manner as before. Collect student claims for each activity to use for assessment.  |