TEACHER LESSON PLAN
Layer It On - Build Your Own Stratigraphy

Standards:

Elementary TEKS (K-5th)	Middle School TEKS (6th – 8th)	ESS TEKS	Enviro. Sys. TEKS	NGSS	
K – 10.A, 11	6th – 10.C	1.A 7.A	1.A 7.A	K-2-ESS1-1	MS-ESS1-4
1ST – 10.A		1.G 9.C	1.F 7.B	K-2-ESS2-2	MS-ESS2-1
3rd – 10.B		2.A	1.G	K-2-ESS2-3	MS-ESS2-2
5th – 10.B, 10.C		3.A	2.A	K-2-PS1-1	MS-ESS3-1
		3.B	3.A	4-ESS1-1	HS-ESS1-6
			3.B	5-ESS2-1	HS-ESS2-1
					HS-ESS2-5

Level:

K-12

Objective:

This simple hands-on activity helps students learn how rock layers form over time and how the deposition of sediments results in the formation of sedimentary rock layers. The activity uses common, everyday food items to build a simple model representing a layered rock formation.

Background Information:

Rock formations can be observed in many places around the world. These formations extend into the subsurface and some of these formations contain valuable natural resources, such as water and fossil fuels. This activity emphasizes geologic processes at the surface and their relationship to the rock cycle. The model reinforces relative dating principles – the methodology geologists use to determine a general history of a rock formation based on the order and relative position of the rock layers. Sedimentary rock layers form in horizontal layers (Principle of Original Horizontality) with the oldest being on the bottom and the youngest on top (Principle of Superposition) and often extend for great distances (Principle of Lateral Continuity).

The processes responsible for sedimentary rock formation are also involved in the formation of fossil fuels in the subsurface. Organic material from land plants (forming coal and/or natural gas) and planktonic marine or lake organisms (forming oil and/or natural gas) may be deposited along with the sediments in a particular environment. Over time, this organic material becomes buried deep underground, where heat and pressure result in the formation of fossil fuels.

Lower grade levels do not explore this area of earth science (relative dating principles), but do focus on the rate of geologic processes and being able to observe these processes by analyzing soil and rock formations. The activity can be extended to include learning about soil horizons (layers) and how their composition changes with depth. The teacher can include how water movement through subsurface layers results in the formation of aquifers and their isolation.

Time Requirements:

20 – 30 minutes

Teacher Preparation:

Materials:

Use food (grains, beans) to build a stratigraphic sequence of rock layers. Colorful choices of grains or beans highlight discrete layers and create more visual appeal.

This activity mimics natural formation of a layered rock sequence from diverse types of sedimentary particles.

Material	Quantity	Notes for Instructor
Grains or beans	200g (1/2lb) of each type of grain or bean/participant	At a minimum, 4-5 different types of grains or beans (e.g., rice, popcorn, lentils, kidney beans)
Large serving containers or dishes for grains/beans supply, spoons for scooping	1 container to hold each type of grain/bean (e.g., 5 large containers if using 5 types), 1 spoon/container	Participants will grab the desired amount from these large containers to build their stratigraphic sequence. Lids for these containers are helpful for transport and storage.
Clear plastic container with a lid to hold the stratigraphic sequence	1 400ml (or larger) clear container/participant	A lid is helpful to prevent spills once the stratigraphic sequence is constructed.

Table 1. Materials for stratigraphy activity

Fig. 1. a) Example grains and beans, as well as a plastic container with lid for building the stratigraphic sequence (all from the local grocery store). b) An example stratigraphic section within the plastic container. A stack of 5 different rock units is displayed next to the stratigraphic sequence as an analogy (Texas Cream Limestone, breccia, Berea Sandstone, desert sandstone and shale, from bottom to top). Photo Credit: Sabrina Ewald and Maša Prodanović

Procedure:

1. Prepare the materials for your students. You may want to have a small container of each grain/bean type prepared at each lab table/desk group for the students to build their model. Include a spoon so that students can add the layers to their containers.

2. To conserve resources, students can work with a partner or with 2 other students to construct the model and complete the activity.

EXTENSION:

A potential extension activity can be an introduction to soil profiles OR an activity for relative dating principles (for an Earth and Space Science class).

Supporting Documents:

Student Worksheet (when you click on the link, the file will automatically download to your computer)

*The student handout can be scaled up or down based on grade level of the class.

REFERENCES:

Image and Diagram Credits found on Student Worksheet:

1 – Bryce Canyon Photo Credit: Sabrina Ewald

2 – Layers of Rocks Illustration Credit: Sabrina Ewald

3 – Sediment/Rock Chart Images Credits:

Gravel - https://commons.wikimedia.org/wiki/File:Small_gray_pebbles.jpg

Sand - https://commons.wikimedia.org/wiki/File:Third_beach_sand.jpg

Silty Mud - https://commons.wikimedia.org/wiki/File:Coastline_Showing_Siltage_From_River_-_NARA_-_543425.jpg

Clay - https://commons.wikimedia.org/wiki/File:Clay_2.jpg

Conglomerate – https://commons.wikimedia.org/wiki/File:Quartz-pebble_conglomerate_(%22Sharon_Conglomerate%22,_Lower_Pennsylvanian;_Jackson_North_roadcut,_Ohio,_USA)_42_(41073010392).jpg

Sandstone – https://commons.wikimedia.org/wiki/File:Quartzose_sandstone_(Eagle_Sandstone,_Upper_Cretaceous;_loose_piece_from_near_cliff_base_at_Pictograph_Cave_State_Park,_southern_Montana,_USA)_(15627845825).jpg

Siltstone - https://commons.wikimedia.org/wiki/File:SiltstoneUSGOV.jpg

Shale/Mudstone - https://commons.wikimedia.org/wiki/File:ShaleUSGOV.jpg

4 – Container Illustration Credit: Sabrina Ewald