Sugar Cube Karst

Submitted by: Dr. Barb Mieras, Geological Society of America
bmieras@geosociety.org

Grade Level: K- 3

Subject(s): Science/Geology

Duration: 1 day

Description: Sinkholes, caves, and underground drainages, sometimes along with steep-sided pinnacles, are typical of the karst topography that forms in soluble rocklayers like limestone. In many part of the country, rivers or streams "disappear" into sinks, only to reappear again in springs downstream. Here's a very simple (and fairly simplistic) model of karst formations for younger kids.

Goal: The purpose of this activity is to explore the way water moves through a porous, soluble substance and to observe the development of pits and channels as the substance dissolves in water.

Objective(s): Student will learn:

1. what is karst?
2. how is karst formed.
3. what are pits and channels?

Teacher Background:
Karst is a type of topography that is formed over limestone, dolomite or gypsum by dissolution of the material, and is characterized by sinkholes, caves, karst towers, and underground drainage. The karst topography usually forms by the flow of groundwater though areas of these soluble rocks. This activity will illustrate the dissolution

Materials
(For each child)

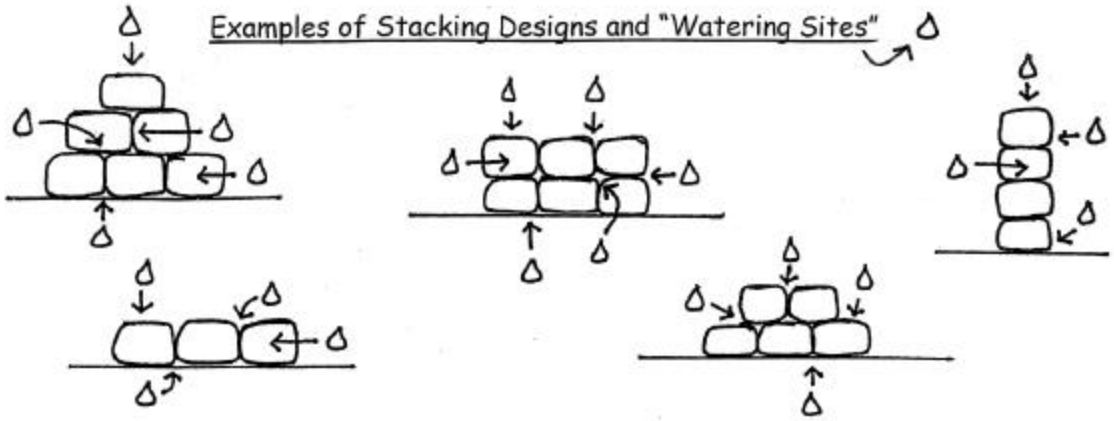
- ✓ A pile of sugar cubes (at least half a dozen)
- ✓ An eyedropper (thin straw will work in a pinch, so to speak)
- ✓ A small container of colored water (blue works well); you may wish to use sugar water to slow the dissolution process, but that does make the activity stickier
- ✓ A tray or other easily cleaned surface to work on

Procedure

Teacher note: Depending on what you wish to accomplish, this particular activity can require some pre-activity discussion of goals and expectations with the kids - otherwise you may end up with thirty little piles of blue sugar water on thirty little desks fifteen seconds into the activity.

1. Stack the sugar cubes on the tray.
2. Put a tiny bit of colored water on top of one of the cubes.
3. Observe where the water moves the cube and how the shapes of the cube change.
4. Add water at a crack between two cubes, a tiny bit at a time.
5. Observe where the water moves through the cubes and how the shapes of the cubes change.
6. Repeat steps 2 through 5 until you make a hole clear through or the sugar cubes collapse.

There are a zillion variations to this activity. You might want students to draw and/or take notes on their observations at each step. You may want to challenge students to form specific "karst" features (sinkholes, towers, caves, etc.) For more advanced students, you might want to add impermeable layers of clay (or another material) between some cubes or layers. You could have them glue together cubes into larger structures or shapes. The glue will stay behind in the shape they made. You might wish to assign different stacking and/or soaking patterns to different students or groups:



A couple of the many possible topics for follow-up discussion include:

1. A comparison of students' results (how do different stacking patterns affect the results? How do different "watering" sites affect dissolution?)
2. Links between the model and the real world (how do fractures in rock layers affect the formation of caves and other dissolution features? how are real rock layers different from the sugar cubes in the model? Where does the water that travels through rock layers come from? how is it different from the water in our model?)

Edited by Glenda Robinson and Christine McLelland, Subaru Distinguished Earth Science Educators, Geological Society of America, Boulder, CO
Subaruteacher@geosociety.org