Where Does the Water Go?

Overview　　This activity builds on the concepts your students learned in Pre-Visit Activity #1 (Limestone) with the knowledge your students acquired while touring Inner Space Caverns. This simulation demonstrates how solution caves are formed.

Objectives　　Students will demonstrate that water will follow cracks in the bedrock as it travels underground and describe how cave passages form along cracks in the bedrock.

Subjects　　Science

　　　　　　　Language Arts

TEKS　　**(5.7) Earth and space. The student knows Earth's surface is constantly changing and consists of useful resources. The student is expected to:**

　　B.　　recognize how landforms such as deltas, canyons, and sand dunes are the result of changes to Earth's surface by wind, water, and ice.

Materials　　Large, flat container (at least 3 inches deep)

　　　　　　　Cookie sheet with raised edges (lasagna pan)

　　　　　　　Hammer/rock

　　　　　　　Hot water

Background

　　　　Water travels along the route with the least resistance. In karst, this path is often along cracks in the limestone formed by faulting. Over a long period of time, carbonic acid (water that has come into contact with CO_2) dissolves the limestone. The voids left behind are called solution caves. Inner Space Cavern, a solution cave, was formed along a fissure from the Balcones Fault, which was active roughly 25 million years ago.

　　　　For more detail on how solution caves form, visit the following website:
http://www.nature.nps.gov/geology/usgsnps/cave/cave.html

Getting Ready

　　　　Fill your deep container nearly full with water and freeze it.

　　　　You may want to have a towel on hand. Watch the water levels in the pan as you do the activity.

Doing the Activity

1.   Turn the container with the ice upside down and empty the block of ice onto the cookie sheet. Explain to the class that this sheet of ice represents limestone.

2.   Hit the block once or twice with the hammer. What happens? Ask the class how limestone might become cracked in the natural world due to uplift and major earthquakes.

3.   Review with your students where rainwater goes once it hits the ground. (Some evaporates, some will run along the surface into watersheds, and some will seep into the ground.) What happens to the water when it seeps through the soil? Review carbonic acid formation. What happens when this carbonic acid reaches the bedrock? Review the concept of limestone dissolution.

4.   Ask your students how they think the carbonic acid will travel through the limestone. What route will it take? Use the cracked ice as an example. The acidic water will flow preferentially through the cracks.

5.   Raise one end of the cookie sheet and support it with a book. Pour hot water over the ice at the high end. Where does the water go? How does it travel? Watch as the water "dissolves" the ice, just as carbonic acid dissolves limestone. The resulting "cave passages" are formed along the preexisting cracks. In the earth, does the water enter only from the high end of the rock? Chances are the water will drain over the earth equally as though the water was being poured over the top of the whole ice sheet. Raising the sheet represents a hill or mountain area where water will flow at the top and collect at the bottom, or valley.

6.   Discuss how caves form in the natural world. There are several kinds of formation processes: stream erosion, lava tubes, sea caves, acid formed caves, etc. What types of caves will form in extensively cracked limestone? What is an example of this? (Inner Space Cavern is a wonderful example of a solution cave!)

Assessment

        Have your students write a paragraph on how this activity ties into the formation of Inner Space. Some questions you might ask to aid in their writing are: What room did we see the fissure in? Which rooms or parts of rooms do you think formed first, and why? Is the void of cave is still growing? Since Inner Space formed along a fault zone that stretches through a large portion of Texas, do you think there are more caves nearby?