Suggested Activities
Processes that Shape the Earth:
Weathering and Erosion

From *Harcourt Science* Teacher' Ed.

Source (Grade Level)	Title	Pages	Concept
Harcourt Science (5)	How Water Changes Earth's Surface	C4-5	Erosion
Harcourt Science (3)	Sand at Work	C38-39	Weathering
Harcourt Science (3)	Types of Soil	C66-67	Soil
Harcourt Science (3)	Saving Soil	C72-73	Soil Erosion

From *Invitiations to Science Inquiry 2nd Edition* by Tik L. Liem

Source	Title	Page	Concept
Liem: Invitations...	Can Stones Dissolve?	398	Erosion and Weathering
Liem: Invitations...	Can Plants Break Rocks?	399	Erosion and Weathering
Liem: Invitations...	Make Stalactites & Stalagmites	397	Erosion and Weathering

Science IDEAS Activities (following this page in the binder)

Title	Concept
Break Rocks	Weathering
Tap Water	Weathering
Settling Out	Erosion
Soil Ingredients	Soil

Please refer to the *Suggested Websites* page in Tab 2 of this binder for activities and demonstrations found online.

CAN STONES DISSOLVE?

A. Question: How can we differentiate between minerals?

B. Materials Needed:

1. Pieces of limestone, marble, granite.
2. Vinegar or dilute hydrochloric acid.

C: Procedure:

1. Observe the pieces of limestone, marble and granite. Ask: “How do they differ? How do we know which is which?”
2. Place a few drops of vinegar or dilute HCl on a flat surface of each of the rocks and observe for chemical reaction.
3. Let stand for a few minutes, then place again a few drops of acid on each of the rocks. Ask: “Which one reacted most”
4. Scratch the surface of each of the stones with the fingernail or a pen knife. Ask: “Which one is the softest? Which the hardest?”

D: Anticipated Results:

Students should be able to obverse the difference between the minerals utilizing vinegar and scratching devices.

E: Thought Questions for Class Discussion:

1. How can we distinguish which stone is which?
2. What are the characteristics of each of the stones?
3. Which of the stones would be eroded most when subjected to the same erosive forces in nature?
4. How would you tell the difference between common salt and marble?
5. What other methods are geologists using to identify minerals?

F: Explanation:

The limestone is the softest of the three and granite the hardest. Limestone can most likely be scratched by the human fingernail (number 4 in the hardness scale), whereas the other two cannot. Limestone reacts most with the vinegar or dilute hydrochloric acid. Marble does react with the acid, but not as readily, because of its more compact structure. Chemically they are the same (calcium carbonate). Other methods that geologist use to identify minerals are: breaking the rock and observing the crystal structure with magnifying glasses or microscopes.

CAN PLANTS BREAK ROCKS?

A. Question: How strong are plants?

B. Materials Needed:

1. Dried lime beans, red beans, or corn seeds.
2. Two small flowerpots and soil.
3. Plaster of Paris (or 'Polyfilla').
4. A piece of window glass (the size of the pot).

C: Procedure:

1. Soak six to ten beans or seeds in water and let stand overnight.
2. Plant the seeds just under the soil surface in the pot, and water.
3. Cover the soil with 1cm thick layer of plaster of Paris (or Polyfilla); cover the other pot (with planted seeds) with window glass.
4. Observe and examine the two pots daily (in pot 1, cracks will appear in the plaster; in pot 2, the glass will be lifted).

D: Anticipated Results:

Students should observe the strength of the sprouting seeds by the new positions of the window of glass and the plaster of Paris.

E: Thought Questions for Class Discussion:

1. Why did the seeds have to be soaked before planting?
2. What happened to the plaster of Paris after a few days?
3. What did you observe the window of glass was doing after a few days?
4. Can we find places where plants have broken through asphalt, brick or cement?
5. If sprouting seeds have such strength, can you imagine how strong the roots of tall trees are?

F: Explanation:

This demonstration may be used as an activity for students to discover the strength of sprouting seeds, and how they can cause rocks to move out of their path of growth or break them up into smaller pieces.

Take the students out on the school yard to find plants that have grown through cracks in the sidewalk, lower edges of the wall, or other such places.

Roots of tall trees can easily break foundations of concrete when the trees are planted too close to the buildings. Large rocks can similarly be broken up by the growth of roots, causing pulverization or erosion of the rocks.

MAKE STALACTITES & STALAGMITES

A. Question: How do stalactites and stalagmites formed?

B. Materials Needed:

1. Magnesium sulfate (Epsom salt).
2. A large beaker and stirrer.
3. Two small beakers, a thick water-absorbent string or cloth.

C: Procedure:

1. Make a saturated solution of magnesium sulfate in water in the large beaker, by dissolving as much of the powder as you can in about 200mL of water (until some solid stays undissolved).
2. Fill the two small beakers with the saturated solution and place a thick water-absorbent string or cloth between the two beakers, such that the center part hangs somewhat lower than the beaker's rim.
3. Let stand for a few days and observe.

D: Anticipated Results:

Students should observe the formation of cones.

E: Thought Questions for Class Discussion:

1. Which cone is called stalactite and which stalagmite?
2. How were the cones formed?
3. What material are the stalactite and stalagmite made up of?
4. What other materials can we use instead of the string or cloth?
5. Where in nature are stalactites and stalagmites formed?

F: Explanation:

Stalactites and stalagmites in nature may be found in underground caves. Groundwater which contains dissolved salts and minerals, drips from the ceiling of the cave. While the drop hangs down, the water evaporates and leaves some of the salts deposited on the ceiling, forming stalactites. Similarly, the stalagmites are formed on the bottom of the cave. The water drops containing the dissolved salts evaporate and keep depositing the salts on the same spot, leaving a cone of slats that were dissolved in the water.

This demonstration is a simulation of the stalactite and stalagmite formation in caves, which may have taken centuries to build up. Water-absorbent paper towel, blotting paper, etc. may be used instead of the string or cloth.

Break Rocks?

Question: How Does Water Break Down Rock?

Prior knowledge questions to ask your students:
What is mass? Can rushing water do damage to the environment?

Materials:
Large rag/cloth, soft rock (ex. Shale, sandstone, chalk), hammer, water, long-handled spoon,
wide-mouthed jar with a lid

Directions/Procedures:
1. Wrap the rock in the cloth, hammer it until broken in fingernail size pieces.
2. Set aside 2 or 3 pieces of rock. Put the rest into a jar ½ full of water. Attach lid tightly.
3. Shake the jar 100 times. Record your prediction of what the water did to the rock.
4. Spoon out 2-3 pieces of rock, compare with unshaken rocks.
5. Put the rocks you removed to the side. Shake the bottle 100 more times.
6. Take out a few more pieces, compare with the rocks taken out earlier.

Data/Observation:
The rock pieces are smaller than the pieces not in the jar.

Journaling Suggestions: What caused the rocks in the jar to get smaller. How would this same process happen in nature?

What Happened?:
The hitting of the rocks broke off small parts of the rocks, decreasing their size and mass. Water pushed the rocks into each other so pieces of the rocks broke off, making the rocks smaller.

Tap Water

Question: Is tap water a solution? Are there minerals dissolved in it?

Prior knowledge questions to ask your students:
Why do sprinkler systems stain sides of homes? Can minerals and chemicals dissolve in water?

Materials: Tap water, distilled water, 2 clear glass saucers, 2 index cards, pencil

Directions/Procedures:
1. Label the 2 index cards A and B.
2. Fill one of the clear glass saucers with tap water. Place this saucer on the index card marked A. Set the saucer in a warm, dry place.
3. Fill the other clear glass saucer with distilled water. Place this saucer on the index card marked B. Place this next to the first saucer.
4. Examine the saucers each day until the water evaporates. Record what you see.

What Happened?
White mineral deposits are left behind with tap water. The distilled water should leave no stains behind. Minerals are dissolved in tap water and any canal, pond, lake or ocean water. The distilled water has these dissolved substances removed.

Journaling Suggestions
Where did the minerals in the tap water come from? What kind of minerals may dissolve in the water of lakes, rivers, and oceans?

Settling Out

Problem: How Does Water Move Different Sized Sediment?

Prior knowledge to discuss with your students:
Moving water has force (energy) to move things. Objects with larger mass take more force to move.

Materials:
Plastic container/lid, small pebbles, sand, soil, water

Directions/Procedures:
1. Place a small amount of pebbles, sand, and soil into the plastic container.
2. Fill the container ½ way with water and place the lid on it.
3. Take the container outside, shake it for 10 seconds.
4. Quickly empty the container onto the ground. Observe where the different particles settle.
5. Leave the particles undisturbed for several hours. Then observe the pattern that forms.

What Happened?
Heavier, larger particles do not move as far away due to their weight. The particles with less weight get carried along in the stream of water. In this activity, the pebbles moved very little. The sand moved farther away and the tiny soil particles moved the farthest away. Water will carry lighter, smaller particles farther than heavier ones.

Journaling Suggestions:
Describe what you observed in the activity. Based on what you saw, where would you be more likely to step on rocks when crossing a river: where the water was moving slowly or quickly?

Soil Ingredients

Question: What ingredients make up soil?

Prior knowledge questions to ask your students:
What is soil? Is there a difference between topsoil and subsoil?

Materials:
1 cup of soil (don't use potting soil), hand lens, tweezers, measuring tape or ruler (metric) and a newspaper

Directions/Procedures:
1. Cover your workplace with newspaper.
2. Place the soil sample on newspaper.
3. Sort through soil particles.
4. Decide if the particles are plants and animals, or minerals and rocks.
5. Place particles in corresponding piles on separate piece of newspaper.
6. If you like, mass each pile and figure out the percentage by mass that each group makes up of the soil.

What Happened?
Topsoil is darker than subsoil. Plants can be grown with materials other than topsoil. Organic material makes soil darker and holds particles together. Soil ingredients are sorted into organic materials and rock sediments (or previously living and nonliving). Topsoil includes 45% rock, 25% air, 25% water and 5% organic material.

Journaling Suggestions:
Where do the organic materials that you found in the soil come from? Do they stay in the soil forever, or are they replenished? Would plants grow at all or as well in soil that was pure mineral and rock?