What's the Connection?

by Karen Parlett

As a science teacher, I am always looking for ways to encourage my students to make connections between what they learn in science class and the world outside. In order for science to be an important part of my students' lives, they must see its relevance. The following 40-minute activity is a simple way to foster thinking about the real-life connections between science class and the world beyond.

The *National Science Education Standards* call not only for "hands-on," but also "minds-on," experiences in the science classroom.[1] Students need to practice critical thinking skills that enable them to express and communicate their ideas effectively. I base many of my activities on a learning cycle of exploration, concept development, and concept application. This approach encourages students to think for themselves and challenges them to make connections between new material and what they already know.

As part of an Earth science unit, I introduce students to rocks and minerals and their uses so they can understand the relationships of these materials with their everyday lives. For example, although students readily recognize that rocks and minerals are used as building materials, they consistently fail to consider that rocks and minerals are pervasive in many other areas.

ANNE BURNS

Many different types of minerals can be found listed in the ingredients of common household products.

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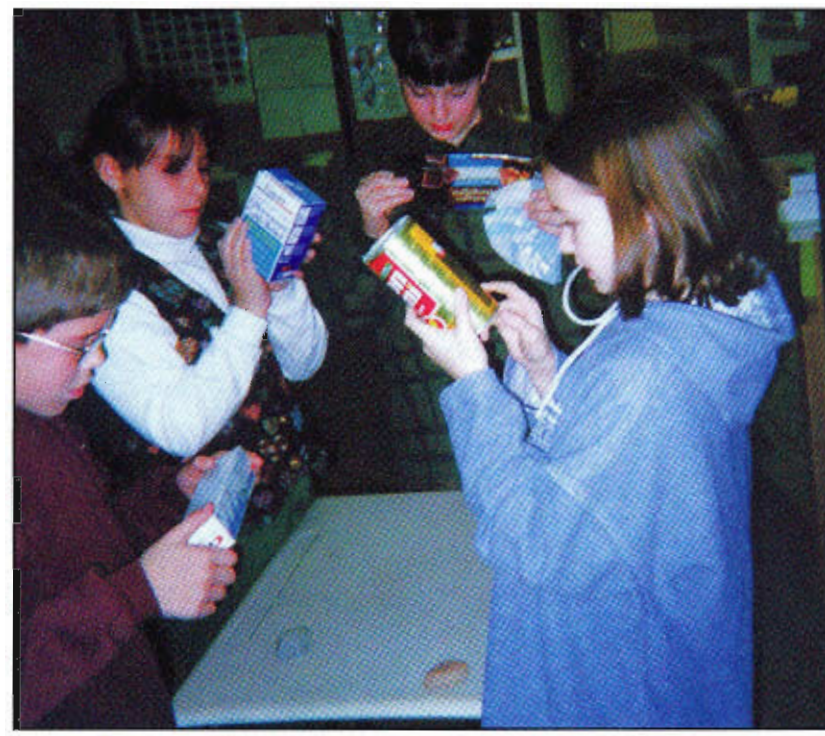
A rock is a rock?

In the exploration phase of this activity, I set up four identical tables in my classroom with common household items, such as deodorants, dishwasher and laundry detergents, antacids, cleansers, artificial sweeteners, medicines, and empty cookie boxes. Students are cautioned not to open any of the packages or containers. On the same tables are several pieces of sandstone and limestone. Cooperative groups of four or five students visit the tables to study the assortment of items and determine how they are related. After studying the items, the students return to their tables and discuss possible connections.

While they work in groups to determine how the items are related, I hear comments, such as "These are things we clean with," and "This is medicine." I also hear, "These are just rocks, why are they here?" After five minutes of discussion, each group shares its ideas with the class, and as a class, they discuss various methods for grouping the items.

As the students bounce around their ideas, I remind them about the rocks and ask them to describe how they fit in with the other items. The most common answers are that they are used for driveways, sidewalks, buildings, and other outside things: "Sometimes rocks are in flower beds," and "Maybe they can be used as tools." Students are frustrated by the question, "How are they connected to the other items on the table?" The students see little connection between the pieces of sandstone and limestone and the cleaning, medicinal, and food products. It just doesn't make sense to them.



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The typical student doesn't make the connection between minerals listed on a cereal box and minerals that make up rocks. Many have never been required to make this connection until now.

Rocks are useful?

After each group shares its answers, we begin the concept development phase of the activity. I introduce the class to the terms *silica* and *carbonate*. They learn that sandstone is a compound of silicon and oxygen, called a *silicate*, and limestone is a compound of calcium, carbon, and oxygen, called *calcium carbonate*. The students refer to the periodic table to find the chemical symbols for silicon, carbon, oxygen, and calcium. This is a quick introduction to the periodic table, which we will work with in more depth in later lessons. Although it would be great to have students research the composition of sandstone and limestone and report their findings to the class, it saves time to tell them as a group.

I brush my teeth with that?

This is when the "*Ah-has*!" fill the classroom. The light bulbs click on, and the students begin to make the connection. They now recognize that the pieces of rock are composed of specific materials, not just hardened dirt.

The students return to the tables to reexamine the items. Again, they are asked to make connections between the pieces of rocks and minerals and the other items. This time, I encourage them to look

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more closely at the ingredient lists. One student, after seeing silica listed as an ingredient on a toothpaste tube, turned to me and exclaimed, "You mean I brush my teeth with sand!"

Each group now shares new ideas for how the items are connected. This discussion focuses on which items contain silica, which have carbonates, and which have both materials. As part of the concept development phase, I ask each group of students to organize the data in chart form. Now they are ready to classify each item as a silicate, carbonate, or a combination of both.

All of the items contain calcium carbonate, sodium carbonate, sodium bicarbonate, calcium silicate, silica, siliceous Earth, and other examples containing the terms *silica* and *carbonate*. When the students ask if antacids or chalk are ground-up limestone, I explain that although commercial calcium carbonate is formed by chemical reactions, it is still the same compound found in some rocks.

So a rock isn't just a rock?

For the application phase of this activity, I ask the students to extend their charts by adding another column labeled "Use." The students complete their charts with items found at home or in a grocery store. They are instructed to limit their lists to silicates and carbonates since this was the focus of our class discussion.

Although I suggest limiting these lists to five or six items, the students get excited about the assignment, and some extend their charts to a second page. Several students have brought in lists of over 20 household items! The students enjoy getting their parents involved and derive great satisfaction from teaching them. Together, parents and students find silicon dioxide on salt containers and drink mixes and carbonate on mouthwash bottles.

This activity encourages students to look at familiar products in new ways. Initially, they are frustrated by the inclusion of the rocks, which seem to have nothing to do with the other items. However, it isn't long before they realize that silicates and carbonates are common in many items, and the students begin to understand that there's no such thing as just a rock. When faced with the test question, "Name several things made of rocks or rock materials," students are able to list many items that reach beyond the scope of building materials. ❑

Reference

1. National Research Council. 1996. *National science education standards*. Washington, D.C.: National Academy Press.

Note

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