Rock Discovery

Summary

Students will identify rocks in this discovery lesson by examining rock characteristics and processes.

Materials

- *Handouts: Take a Closer Look,*
  Rock Formations,
  What's this Rock? -- Reference Sheet,
  What's this Rock? -- Cards,
  Rock Cycle Song,
  My Rock Discovery Field Guide
  Rock samples, hand lens, solid color taffy pieces
  Rock Field Guides, template, hole punch, cord

Additional Resources

Books

- *If you find a rock*
  , by Peggy Christian: ISBN 0-15-239339-0
- *First field guide: Rocks and minerals*
  , by Scholastic: 0-590-5484-8
- *Rocks and minerals, my first pocket guide*
  , by National Geographic ISBN 004390655650-X
- *Everybody needs a rock*
  , by Byrd Baylor, ISBN 068971058

Videos

Eyewitness Rocks and Minerals; Item #1234 OR ISBN 1234567890
Bill Nye the Science Guy-Erosion

Background for Teachers

We will be using the idea of rock forming processes to identify rock characteristics, thus identifying the rock. The name of the rock is secondary to the knowledge of how and where in the process it was formed. Each activity will start with an inquiry/learning segment, after which the students will revise their ideas of the material. Students should already have been exposed to the three basic rock types: igneous, sedimentary, and metamorphic. By the end of the lesson, students should understand the processes that form the three main types of rock, as well as identify characteristics of some common rocks.

Rocks are combinations of minerals found naturally on or in Earth. Rocks record the history of Earth in their structure. Earth materials can change over time from one form to another. Rocks can be identified by properties such as color, crystal size or texture, banding patterns, presence of pores, and other characteristics. Color is an easy one for students but not all that helpful. The size and shape of the particles that make up rock or lack of them, are more meaningful. Characteristics of the three categories of rocks are used to help students identify rocks found in Utah.

Eroded materials, dissolved mineral, and the remains of living things are moved by water and wind and deposited as sediments. Sedimentary rock is formed when these sediments become solid material. Most were formed of sediments deposited by ancient shallow seas. Sedimentary rocks include having rounded fragments of a variety of sizes, occurring in thick layers, and--in the case of water deposited minerals--a very smooth texture. The sediments are held together by mineral

cements which have testable properties. If calcite is the cement it will fizz with acid. Most limestone, some sandstone, and some conglomerates will fizz.
All igneous rocks were once molten rock. Their locations in Earth's crust controlled the rate at which they cooled. When magma cools before reaching the surface it cools slowly and tends to have large crystals. This is called intrusive rock, like granite. Other igneous rocks form on Earth's surface, cooling more quickly. The crystals formed are often microscopically small. These are called extrusive rock, like basalt or obsidian.
Metamorphic rocks have been changed by heat and pressure over time, but not enough to melt them. These rocks may have been buried under Earth's surface or have been near a heat source. They form from igneous, sedimentary or other metamorphic rocks. They are recognized by the occurrence of thin banks or layers which form as minerals in the rock rearrange themselves.
Lesson sequence: This lesson should be taught after students have knowledge of the three types of rocks.

Intended Learning Outcomes

1. Use Science Process and Thinking Skills
2. Understand Science Concepts and Principles

Instructional Procedures

Invitation to Learn
Look at the items or pictures. What type of rock do you think the items were made from, metamorphic, sedimentary, or igneous? Mark you answer on the tally sheet.
Children have a natural excitement and interest in rocks. They see them everywhere. Use this connection and take advantage of student's travels throughout the state, as well as in their own community to advance their motivation to learn and discover.
Instructional Procedures
This is a discovery lesson. Students will use the inquiry method, participate in learning activities, and then restructure their learning as they go. Be careful not to give in to the urge to provide all the answers before they have a chance to think and process the discussion. You will be assessing their understanding as you go. Every time you see REVISE IDEAS , students are experiencing things that can change their ideas about what they are learning. These are good opportunities to bring the class back for some discussion.

> We are going to be learning about processes that have been going on inside and outside Earth for all of its history. Rocks are changing all the time, but "time" in the geological sense is millions of years. By understanding the cycle that affects rock, we can look at rocks around us and try to tell their story: where they have been and what processes made them what they are now. Give students a piece of paper. Ask, "what do you think a rock cycle might look like? Take a minute and draw your idea of what a rock cycle might be." Emphasize that this is a rough sketch, a pre-assessment to see ideas. Pick one person from each table to stand and briefly share their ideas. *Remember, it is important for them to come up with their idea of this process so they can revise as they learn more about it. No right or wrong on this activity. REVISE IDEAS .
> In order to understand some of the rock processes, we need to talk about some action words that describe what is going on. Ask the students for discussion and list on the board. Add additional words as needed, and circle key words they need to know. We are going to make a vocabulary helper to keep with us as we discover the rock processes. Pass out *Take a Closer Look* handout. Students will cut out the wheel and put it on the magnifying glass with a fastener. When they are finished have them try to match the words with the definitions by moving the wheel. After everyone has had a turn to work with it, call for volunteers to state the definitions that match the words. This is a self-checking activity the students check during the discussion.

REVISE IDEAS .

Pass out the black line of *Rock Formations* with no labels on it. Have students compare this to their rock cycle. What things are similar? What things are different? Using their vocabulary wheel words, discuss what processes are occurring on the rock cycle graphic? After some group responses, ask the class to come up with sentences describing what is going on in the picture. For example, "I see a place where rock looks like it is melting from the heat." Have a student try this using each word. There are three main processes in the rock cycle. These processes can happen over and over again during geologic time. Thus the idea of rock cycle. The rocks we look at today have been in many different places during their geologic history. As we look at them, we can observe their characteristics to see what they have become. Using the labels, have students lightly glue the labels in the correct locations. They may make some adjustments later as they REVISE IDEAS .

It's time to look at rocks. Give each table a set of rocks. Have students use hand lenses to spend some time observing rocks. Look at the characteristics that are most obvious. What kind of process might have caused this rock to look this way? Next, within your group, each person picks a rock and tells the others what might have happened to that rock to make it look like that. For instance, "I see a lot of layers that might have gotten there by sediment layering and pressing together." Let everyone have a turn. After the discussion, pass out *What's This Rock? -- Reference Sheet* , and *What's This Rock? - Cards* . Introduce (or review) the three basic types of rock forming process: igneous, sedimentary, and metamorphic. Looking at the general characteristics of each type of rock on your table, and then looking at the rock descriptions, match up the names with the rocks. Discuss with your group why the rock was placed with that label and why it doesn't belong with one of the other labels. REVISE IDEAS .

Pass out three different solid color taffy pieces to each person. Start by unwrapping the pieces. Say "We are going to use our taffy to demonstrate the processes that form the three basic types of rock. Who would like to try sedimentary?" If no one volunteers, go ahead and demonstrate. Flatten out three colors of rock in your palm. Lay them on top of each other to demonstrate layering. Metamorphic: Take taffy and twist and fold it to show how the heat and pressure work on rocks inside the Earth. Igneous: Place the taffy inside your hand or under your arms to represent melting. Next, have students divide into three groups for the *Rock Cycle Song* . Pass out the song and choose one type of rock for each group. Practice a minute and then SING. After this review activity, have students go back to their rock cycle graphic and see if they would like to make any changes on their label placement. Now put up the overhead of the graphic to have students correct any mistakes in the label placement. Glue labels securely. REVISE IDEAS .

After groups have worked on naming rocks using characteristics, introduce the Rock Field Guide . This is a great reference to identify rocks. See if your group can find the rocks you have in this guide to verify the names you have put with the rocks. REVISE IDEAS . The last part of this activity is to make your own rock field guides. Using the template, write a description for each of the rocks on your table. Draw a small sketch of the rock. Decorate your cover, punch holes along the top, and tie with cord. You can add to this when you find rocks you like.

*Students should have gained a good understanding of the processes that make rocks, and the characteristics of common rocks of Utah using the discovery/inquiry method.

Extensions

Curriculum Extensions/Adaptations/Integration

Advanced students may be given the task of creating their own master of the rock cycle.

Technology: Using the computer, students can make a "rock field guide," or create a power point presentation about rocks or the rock cycle.

Music: Students can make up their own rock cycle song or raps.
Math: Graph a rock collection by weight, size, texture, color, layers, fizz, where they were found, etc.
Art: Put up paper and have students make a wall-sized mural of the rock graphic. Place actual rocks where they are being formed.
Writing-Students bring in their own rock and write a story about its' life and the changes it goes through to become what it is today.
Since this is mostly a group activity with interaction, slower learners can fully participate with a partner doing the reading and guiding. The teacher could provide a labeled rock cycle for the students to use.

Family Connections

Rock collecting is a great family activity. There are many places in Utah to collect a variety of rocks.
Rocks are used for so many things. Have students go on a rock hunt for homework and list the uses of rocks in and around their homes. Add the use of a digital cameral and they could make a great poster.

Assessment Plan

Ongoing assessment is a big part of this activity. At each step you can verbally assess, as well as monitor what students are learning. As you monitor, you can re-teach as they reframe their knowledge.
Use the overhead of the graphic and have students check their final placement of labels.
Use the field guide to verify rock names.

Bibliography

Woods, Robin, (1994). A close-up look at how children learn science". *Educational Leadership*. Feb.1994, pgs.33-35.
Building on her desire to understand how children learn science, the author designed a science lesson that uses the "Conceptual Change" idea. It was that the students will revise their theories of the natural world, once they see and learn new evidence, based on their investigations.
Champagne, A.B., R.F. Gunstone, & L.E. Klopfer, (1985). Instructional consequences of students; Knowledge about physical phenomena. *Cognitive Structure and Conceptual Change*. edited by L.H.T. West and A.L. Pines .Orlando, Fla.: Academic Press.
The constructivist model of learning contends that each student must build his or her understanding. In such a process, understanding can never be completed. Each student must work through his or her path toward deeper and deeper understanding and skills. Research for these learning strategies focuses on students being engaged in open-ended activities in which they try using their previous knowledge, participate in new learning experiences, and then restructure their beliefs.

Authors

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