

Lesson Plan

Assessment	AFL, Activities, Exit Card
Cross-curricular	

Big Ideas

- Earth is very old, and its atmosphere, hydrosphere, and lithosphere have undergone many changes over time.

Learning Goals:

- I understand that geologists rely on two main types of dating: relative and absolute.
- I know the 6 Relative Dating Principles.
- I can describe how layers of sedimentary rock demonstrate the Principle of Superposition, the Principle of Horizontality, and can demonstrate the Principle of Inclusion.

Specific Expectations

D3. demonstrate an understanding of how changes to Earth’s surface have been recorded and preserved throughout geological time and how they contribute to our knowledge of Earth’s history
 D3.4 compare and contrast relative and absolute dating principles and techniques as they apply to natural systems (e.g., the law of superposition; the law of cross-cutting relationships; varve counts; carbon-14 or uranium-lead dating)

Description

In this lesson students will understand that geologists rely on two main types of dating: relative and absolute using some hands on models. **This lesson is intended for the university level.**

Materials

Relative Dating Visuals
 Jigsaw Answers and Rubric
 Relative Dating Lab: Sand (different sizes if available), Gravel (different sizes if available), Shell fragments, Wide-mouth jar with a screw cap

Edible Rocks: ½ a Bite Sized Snickers Bar
 Definitions Handout
 Relative Dating Lab and Edible Rocks Activity
 Discussion Questions Answers

Safety Notes

Edible Rocks activity contains nuts.

Introduction

Jigsaw Activity – Relative Dating Visuals (See Link)

Make groups of 3-5, selecting an expert for the group. Each group will have one question to research and the group will create “notes” (a poster, flyer, or slideshow) to share their information with the other groups.

Questions include:

1. How old did humans think the Earth was prior to 1800? How did they obtain this value?
2. Explain James Hutton’s Principle of Uniformitarianism?
3. Lord Kelvin was an extremely influential scientist in the mid 1800’s- what was his calculated age of the Earth? How was he proven wrong?
4. List the 6 Relative Dating Principles.
5. What is an unconformity? How did unconformity provide Hutton with evidence for uniformity?
6. What is the difference between the law of superposition and the law of cross-cutting relationships?

Once each group has completed their document, the groups will “jigsaw” with the expert joining a different group and explaining their subject. The teacher may collect the “notes” to assess for Knowledge and Understanding as well as Communication (Rubric and Answer Key see Link). All students should receive a copy of each other’s documents for their notes.

Relative Dating allows geologists to place events in order: they may hypothesize that one event has occurred before or after another, but they cannot determine the chronological age of the events by way of these methods. Geologists use stratigraphic columns to show a sequence of sedimentary rocks, with the oldest rocks on the bottom and the youngest on top. **Absolute dating** allows scientists, archaeologists, and geologists to determine the chronological age of objects by way of examining physical characteristics.

Examples of absolute dating include:

- Written records (dates on coins or other written documents)
- Counting Tree rings
- Counting layers in ice core samples
- Radiometric dating (carbon or uranium dating, luminescence dating methods etc.)

Action

Relative Dating Lab Activity (See Link)

In Groups of 3, observe how the size and type of particles can affect the deposition of sedimentary layer by creating your own sedimentary profile.

Sediment Deposits

Group Materials:

- Sand (different sizes if available)
- Gravel (different sizes if available)
- Shell fragments
- Wide-mouth jar with a screw cap

Instructions

1. Take the glass-canning jar and add equal amounts of sand(s), gravel(s), and shell fragments (1/3 to 1/2 of the jar).
2. Fill the remainder of the jar with water.
3. Cover tightly and add electrical tape around the perimeter of the lid area to add more security.
4. Shake vigorously.
5. Allow the sediments in the jar to settle for one or more days.
6. Observe what occurs to the sediments as they are deposited.
7. Draw a labeled sedimentary profile.

Discussion

1. Identify the layers of deposition.
2. Where may depositions like this occur?
3. In what order did these layers occur (i.e. which is the oldest layer)?

Adapted from Relative Age Dating by Nancy Volk,

http://www.most.org/curriculum_project/earth_science/middle_school/prior/relative_age_dating.pdf

Now, another great activity to try if there are no students with NUT ALLERGIES in the class is

Edible Rocks Activity (See Link)

Each student should draw chocolate, caramel, nougat and peanuts. The oldest layer is likely the bottom chocolate layer, the next oldest layer is probably the nougat, and the caramel/peanut layer is next. The layers demonstrate the Principle of Superposition, and the Principle of Horizontality, the caramel/peanut layer is explained by the Principle of Inclusion).

Individual Materials

- ½ a Bite Sized Snickers Bar

Instructions

1. Draw a cross-section, or profile, of the Snickers Bar. Use your observational skills to determine how many components there are to your “rock”.
2. Draw a step-by-step process of how the rock formed (i.e. Step 1, draw the oldest layer first)

Discussion

1. What is the oldest layer of the rock? How do you know?
2. What is the youngest layer of the rock? How do you know?
3. Which formed first, the peanuts or the caramel? How do you know?

Adapted from Edible Rock Activity

http://meteorite.unm.edu/site_media/pdf/edible.pdf

Consolidation/Extension

Exit Card/Assignment

Explain how your “rock” profile demonstrates the Principle of Superposition, the Principle of Horizontality, and the Principle of Inclusion. You should use your profile drawing and the step-by-step process drawing.