

Teacher's Guide

MARS AND EARTH COMPARISON; SOIL CLASSIFICATION

OVERVIEW:

This science activity will consist of a series of demonstrations and an experiment that emphasize “comparing and classifying.” The content of the activity focuses on planets, atmospheres, soils, and classification of objects. Students will work in groups of four for their hands-on experiment.

TERMS WE WILL BE USING:

- **Content related**— asteroid, astronomer, astrobiologist, atmosphere, fossil, gas, infiltration, landforms, meteorite, nanobacteria, particle size, percolation, soil moisture, soil profile, soil texture, soil types, solar system
- **Process related**—observation, hypothesis, comparison, classification, prediction, dependent variable, independent variable, inference, data

OUTLINE OF WORKSHOP:

The first 50 minutes will consist primarily of slides, demonstrations about classifying objects, and a discussion of the search for life on Mars in the “fossil evidence” of martian meteorites. We will compare the atmospheres, soils, and soil characteristics of Earth and Mars.

Students will then break out into groups of four to examine some soil components (sands, clays, pebbles, and organic matter). Each student will examine three vials of soil particles and use their senses to record data on particle size, texture, smell, and color. The group will then combine their samples and decide how they would classify them based on what they need to do with the soil; i.e., they will be assigned roles (farmer, builder, artist) and will need to decide which properties of the soils would be the best to use to classify them.

After the group session, students will observe a class experiment on how soil texture affects infiltration of water into the soil. Students will make predictions and then test their ideas with a brief experiment. We will close with the “science seminar” in which the students compare their findings and discuss the importance of soils and soil properties.

SOUTH CAROLINA STANDARDS COVERED:

Sci	Life Sci	Organisms and environment	Characteristics--biomes, biodiversity
Sci	Life Sci	Organisms and environment	Organisms and environment--interactions with environment
Sci	Earth Sci	sky patterns	Objects in the sky--movement of planets, Earth, sun
Sci	Earth Sci	weather and climate	Changes in earth and sky--daily and seasonal weather patterns
Sci	Inquiry	Process skills	observe, classify, measure, communicate, infer, predict, hypothesize
Sci	Inquiry	Inquiry skills	Plan and conduct simple investigations
Math	Alg-S1	Understand patterns, relations, and functions	Describe, extend, and make generalizations about geometric and numeric patterns
Math	Alg-S1	Understand patterns, relations, and functions	Represent and analyze functions, using words, tables, and graphs
Math	Alg-S2	Represent and analyze mathematical structures	Use variables

Math	Alg-S2	Represent and analyze mathematical structures	Use equations
Math	Alg-S3	Use models to represent and understand quantitative relationships	
Math	Alg-S4	Analyze change	How one variable affects another
Math	Alg-S4	Analyze change	Compare varying rates of change

SUGGESTED FOLLOW-UP ACTIVITIES:

Science and Math

- **Follow up sheet**—Do the science/math follow-up sheet for the Activity 2 soils classification workshop.
- **Science Fiction Story**—A science fiction story is an imaginary tale based on scientific information and sometimes includes the possibilities of future events. Research science facts to use in your story about human exploration of Mars.

Language Arts

- **Research (Reading)**—Go to the library and find articles on the landers that will land on Mars in January 2004. Read the articles and do a presentation for your class.
- **Bulletin Board (Reading)**—Research Mars, especially human efforts to send instruments to Mars, and create a bulletin board or other display for your teacher.
- **Puppet Show (Drama)**—Create a puppet show about life on Mars
- **Flashcards (Vocabulary)**—Make vocabulary flashcards from the Activity 2 definitions sheet and spend 10 minutes every day studying your cards.

Technology

- **Internet Research**—Use the Internet to do further research on “Mars in the news.”
- **Invention**—Martian land rovers were designed to pick up rocks on the Mars surface so that the rocks could be analyzed by computers inside the rover. Invent and construct a “claw” that can pick up a pencil. No touching the pencil with your hands! Demonstrate your invention to your class!

Physical Education

- **Game**—Using the “solar system” cards that we can provide, create a relay game that involves identifying the planets, stating a solar system “fun fact,” and running amok on the playground.

Art

- **Scientific Drawing**—Make a scientific drawing of a soil profile and some of the animals found in a soil column; label the parts.
- **Make a fossil**—You’ll need the lid to a shoe box or a piece of thick cardboard 15 cm x 30 cm, 500 ml of All Purpose Flour, 250 ml of salt, 25 ml of room temperature tap water, a large leaf with good veins in it, a mixing bowl and a fork. Mix together the flour and salt. Add the water and mix with the fork until a large lump is formed. Don’t stir too much. Spread the dough mixture into the lid of the shoe box and smooth it flat. Gently press your leaf into the soft dough making sure all the leaf is against the dough. Let the dough dry for five hours and then remove the leaf; then let it completely dry for two days. You have a fossil - or something that sort of looks like one anyway. You can paint your fossil gray so that it looks more like a rock, and label it with the name of the leaf you used to press in the dough.
- **Martian topography**—Topography is the study of landforms and the features that make up the three dimensional surface of a planet. Make a three dimensional topographic map of the surface of Mars using a real photograph from Mars. Go to this web site <http://mars.jpl.nasa.gov/mgs/> and choose a picture of the Martian surface that interests you. Print out the picture along with the information describing it: how deep it is, or how long, or what it’s called. Now try and re-create, in three dimensions, the picture of the landform you found of Mars. Use the flour and salt dough recipe above to make a kind of molding clay that you can spread out into the lid of a shoebox and texturize with your fingers, pencils or paperclips. Let it dry for a couple of days, paint it with tempera paints, and label it with the dimensions you found on the photograph: 3 kilometers long and 2 kilometers deep with shallow trenches. You can even give it a name if it doesn’t already have one.