

## Mars Exploration, Grades 5-8

### Project Description:

NASA is planning its Mars-Nerva mission for the 22nd century, but your students can prepare to colonize Mars now. They'll get to construct a stable landing structure, operate a simulation of the Rover, and examine geological specimens to determine if Mars is suitable for human life.

### Vocabulary:

Mars	control	remote-controlled
experiment	contamination	

### Possible Class Activities:

- View 3-D slides of Mars.
- Construct landing structures of wooden sticks and test them outdoors.
- Set up a base camp with real radio communicators.
- Operate a remote-controlled, camera-equipped Rover to find a suitable dig site.
- Use construction equipment to move specimens to the lab.
- Examine and classify crystal formation under magnification.

### Pre-Visit Activities (in your classroom):

- Discuss NASA's past missions to Mars.
- Review NASA's upcoming missions to Mars.
- Explain crystal formation.
- Diagram each possible crystalline formation.

### Post-Visit Activities:

- Design your own mission to Mars.
- Make a list of survival equipment for an Earth mission.

### Related Web Sites:

The Nine Planets: A multimedia tour of the Solar System – by Bill Arnett  
<http://seds.lpl.arizona.edu/nineplanets/nineplanets/nineplanets.html>

Planetary Data System  
<http://pds.jpl.nasa.gov/>

Welcome to the Planets  
<http://pds.jpl.nasa.gov/planets/>

Size Comparisons between Earth and other Planets

<http://ic-www.arc.nasa.gov/ic/projects/bayes-group/Atlas/size/Earth/>

Exploring Planets in the Classroom - Hands on activities

[http://www.soest.hawaii.edu/spacegrant/class\\_acts/index.html](http://www.soest.hawaii.edu/spacegrant/class_acts/index.html)

**State of California Science Standards met in this class:**

**Grade 5  
Earth Science**

**5.** The solar system consists of planets and other bodies that orbit the sun in predictable paths. As a basis for understanding this concept, students know:

**a.** the sun, an average star, is the central and largest body in the solar system and is composed primarily of hydrogen and helium.

**b.** the solar system includes the Earth, moon, sun, eight other planets and their satellites, and smaller objects such as asteroids and comets.

**c.** the path of a planet around the sun is due to the gravitational attraction between the sun and the planet.

**Grade 8  
Motion**

**1.** The velocity of an object is the rate of change of its position. As a basis for understanding this concept, students know:

**a.** position is defined relative to some choice of standard reference point and a set of reference directions.

**b.** average speed is the total distance traveled divided by the total time elapsed. The speed of an object along the path traveled can vary.

**c.** how to solve problems involving distance, time, and average speed.

**d.** to describe the velocity of an object one must specify both direction and speed.

**e.** changes in velocity can be changes in speed, direction, or both.

**f.** how to interpret graphs of position versus time and speed versus time for motion in a single direction.

**Forces**

**2.** Unbalanced forces cause changes in velocity. As a basis for understanding this concept, students know:

- a.** a force has both direction and magnitude.
- b.** when an object is subject to two or more forces at once, the effect is the cumulative effect of all the forces.
- c.** when the forces on an object are balanced, the motion of the object does not change.
- d.** how to identify separately two or more forces acting on a single static object, including gravity, elastic forces due to tension or compression in matter, and friction.
- e.** when the forces on an object are unbalanced the object will change its motion (that is, it will speed up, slow down, or change direction).
- f.** the greater the mass of an object the more force is needed to achieve the same change in motion.

### **Earth in the Solar System (Earth Science)**

**4.** The structure and composition of the universe can be learned from the study of stars and galaxies, and their evolution. As a basis for understanding this concept, students know:

- a.** galaxies are clusters of billions of stars, and may have different shapes.
- b.** the sun is one of many stars in our own Milky Way galaxy. Stars may differ in size, temperature, and color.
- c.** how to use astronomical units and light years as measures of distance between the sun, stars, and Earth.
- d.** stars are the source of light for all bright objects in outer space. The moon and planets shine by reflected sunlight, not by their own light.
- e.** the appearance, general composition, relative position and size, and motion of objects in the solar system, including planets, planetary satellites, comets, and asteroids.

### **Density and Buoyancy**

**8.** All objects experience a buoyant force when immersed in a fluid. As a basis for understanding this concept, students know:

- a.** density is mass per unit volume.

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- b.** how to calculate the density of substances (regular and irregular solids, and liquids) from measurements of mass and volume.
- c.** the buoyant force on an object in a fluid is an upward force equal to the weight of the fluid it has displaced.
- d.** how to predict whether an object will float or sink.