Activity 1: Getting Started in Mars Exploration

Purpose
To probe students' understanding of Mars and to have each student create a Mars Journal.

Overview
Students examine the Image Set and write down their observations and questions. They share their impressions and questions, giving the teacher a sense of the students' particular interests, misconceptions, and general understanding of Mars, the solar system, and space exploration. Finally, each student creates a Mars Journal that they will continue to use throughout the Mars modules.

Key Concepts
- Mars is a neighboring planet.
- Mars has a variety of landforms many of which are similar to ones found on Earth.
- Spacecraft have visited Mars and returned images and data.
- Journals help people record and organize their thoughts and are valuable tools in scientific research.

Skills
- *Observing* and *interpreting* unfamiliar images
- *Using* a journal to record and organize ideas
- *Asking* questions to understand something new

Materials
Paper, staples, glue, tape, markers, a collection of Mars images, etc., to construct a journal

Preparation
- Collect newspaper or magazine articles about Mars
- Find out current status of Mars exploration from NASA's Mars Web site.

Time
1-2 class periods.

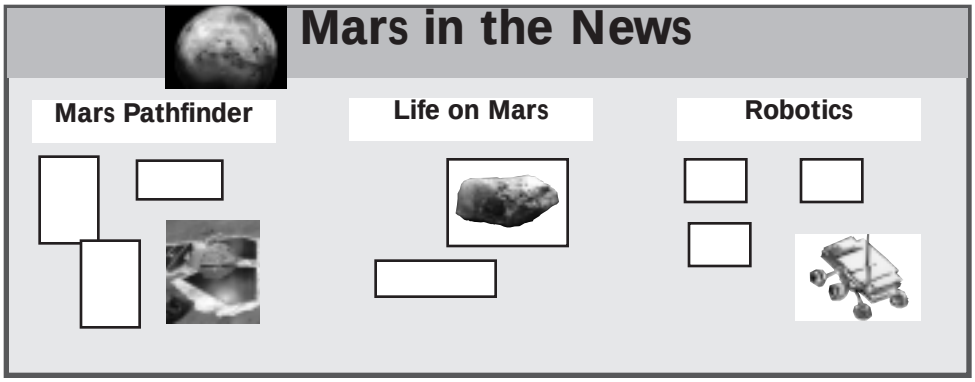
BACKGROUND

Journals are essential tools of science – field researchers and experimental scientists always use journals. They record observations, sketch scenes, keep track of data, and write new ideas. Often scientists use journals to track the development of their ideas and to record their questions.

Clippings of news articles about the Mars Pathfinder landing

Once you record data, observations, and ideas in a journal, you no longer need to remember everything; the brain is free to think new ideas. Additionally, journals enable people to organize the data they have collected and the observations they have made.

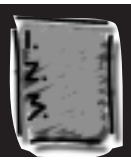
If you choose to look at your students' journals, they provide a unique window into your students' ideas, interests, questions, skills, and learning styles. In addition to evaluating their grasp of the facts, understanding these other dimensions can help you have a better sense of what your students know, what misconceptions they might have, and what might help them to learn. On the other hand, if you prefer to treat journals as confidential, your students will still benefit from keeping journals for the reasons mentioned above. Once your students start their journals, they should continue to use the journals throughout the Mars learning activities.

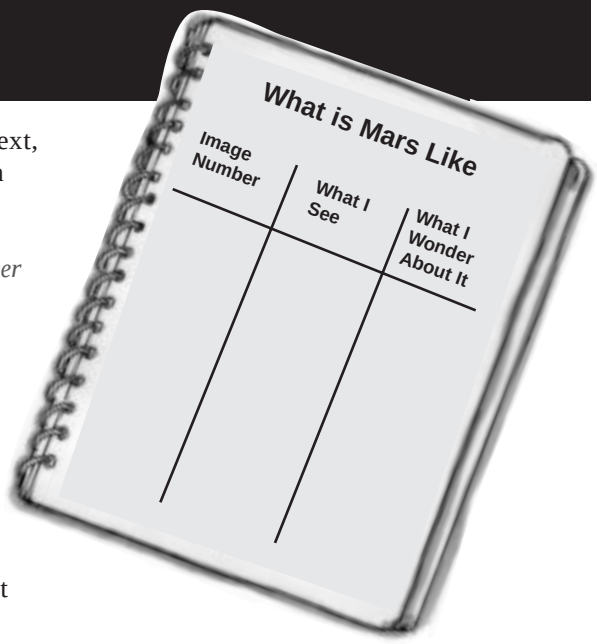


Sample Bulletin Board Layout

Consider creating a Mars bulletin board for posting news and images. See Activity 6 for suggestions on incorporating space-related current events into your program.

PROCEDURE





1. Have each student title a piece of paper "What is Mars Like?" Next, have them divide the page into three columns. Label one column "Image Number," the middle column "What I See" and the last column "What I Wonder About It."
   Explain to your students that they will be learning more about Mars over the next few weeks, including conducting some classroom experiments, exploring live data and images from Mars, and comparing Mars and Earth. Ask them to pay attention to news about Mars and to bring in Mars-related things for the classroom and bulletin board.

2. Organize the students in small groups and distribute Image Sets to each group. Ask students to look at the images and write their observations and questions on their paper.

3. After about ten minutes, conduct a discussion exploring their first impressions using questions such as:
   - How were these images taken?
   - What images interested you most? Why?
   - What do you think caused the surface to look like this?
   - What questions do these images raise for you?
   - How is Mars different from Earth?
   - What is Mars? What is a planet?

   This step enables you to get a sense of what your students understand about Mars and space exploration and what misconceptions they might have. The focus at this stage is for you to listen to their comments and questions and not to explain facts about Mars. Generate a discussion about what students think Mars is like. Students might mention that it is rocky, which they know from the Pathfinder images. They might know that Mars is a point of light in the night-time sky because they've seen it. They might know that it is "far away" because it took the Pathfinder seven months to get there. Generate some discussion about what interests them about Mars, what they're curious about, and what questions they have. Have them record their questions in their journals.

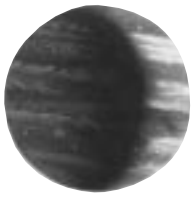
   Your students' comments might provide you with the opportunity to talk about the role of evidence in furthering understanding. You might mention that, for most of time, whatever people knew about Mars came from what they saw with their eyes and, later, what they could see through a telescope. Now robotic missions to Mars (like Pathfinder) provide tremendous amounts of new information. The profound lack of data constrains our current understanding of Mars, so even the most expert scientists are excited about the new opportunities these missions provide to learn about Mars.

4. For their Mars Exploration Journal, have students bring in a notebook or create a booklet by stapling about 20 sheets of paper together. Have them design a cover. If possible, start making the cover in class and finish it as homework.
   At a minimum, the journal needs to have the title Mars Journal, the student's name and the start date. Explain that they will record their notes and ideas as they learn about Mars. Their notebooks will also include observations from their classroom experiments, graphs of their data, sketches they draw, and questions that occur to them as the learn and explore. You might provide some pictures clipped from magazines or downloaded from the Web that students can use as part of their cover.

BEFORE GOING ON

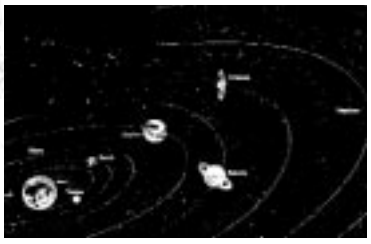
Some teachers prefer teaching space science by starting with a broad view of the solar system and systematically narrowing their focus. While it is important that students understand a few basic concepts about planets before going further in this module, research shows that jumping into the middle of a topic can be an even more effective way to start. Starting "in the middle" forces students to organize new information and ideas into a comprehensible framework, a critical element in learning. Also, as students are figuring out a topic, they ask personally meaningful questions, the basis of motivation and involvement.

Before proceeding with the rest of the module, review the concepts about the solar system and about Earth and Mars as planets in the Appendix. If these ideas are new to your students, use the hands-on activities in the Appendix to develop these concepts before continuing with the rest of the module. Use your judgment as to which concepts would most help your students achieve success in the rest of the module.



Appendix Activity 1-- Make Scale Models of the Planets

By making models of each planet at the same scale, students see how the planets compare in size.



Appendix Activity 2-- Make a Model Solar System

In this activity, students learn about the organization and scale of the solar system. Students make a model of the solar system using the same scale they used for the planet models in Appendix Activity 1. When people see a solar system model in which both the sizes and distances of the planets from the Sun are at the same scale, they are usually surprised by how small and far apart the planets are!

Appendix Activity 3 -- Find Mars in the Night-time Sky

When ancient astronomers noticed that Mars moved slightly from one night to the next, they considered it a special "star." If the timing is right, your students will be able to see Mars in the night-time sky. If they observe it over a few weeks, they too will notice that it moves. This activity enables your students to know where and when to look for Mars.

Note: Mars is visible at night for several months. Then, it dips below the horizon and cannot be seen again for several months. The activity also explains how to determine where you are in this cycle.