

Mars Data Analyzer

Suggested Grade Level: 3–6

Summary

- Students will use the process of scientific questioning, observation, analysis, and communication using Mars Exploration Rover images.
- Students will analyze and learn about Mars by choosing their own questions.

Standards

NM Science Content Standard: Strand I, Scientific Thinking and Practice National Science Education Standards: Standard A, Science as Inquiry

Background Information

The common conception of “doing science” usually involves laboratory experiments or numbers, but the primary data used by planetary geologists are frequently the images (computer-generated pictures) that are sent back to Earth by spacecraft, lander, or rover. What can scientists learn from images and how are they used to “do science”? When planetary geologists begin to look at new images from a planetary surface, they often pose a question that they want to solve, make observations related to that question using the images, then make conclusions based on their new observations. The two images included in this activity can be used as a framework for posing questions or you can focus your students’ questions using a globe or map or some other image of Mars. The questions that are posed must be carefully selected so that they can be solved by detailed observations and analysis of the image(s) or in association with other information or data that can be easily collected and researched by the students. Questions could include: Does the surface of Mars look the same everywhere? Do the rocks of Mars look the same everywhere? Are rock sizes the same everywhere on Mars? Is there any evidence for wind on Mars? Is there any evidence for water on Mars? Is there any evidence for volcanoes on Mars? Is there any evidence for life on Mars?

Materials for Each Team

- Two images included in this activity (Spirit landing site and Opportunity landing site)
- Data Sheets #1 and #2 included in this activity
- One file folder
- Six sheets of paper of any kind (lined, white, color, or graph)

Preparation

1. Print and photocopy 1 copy of Data Sheet #1 and #2 for each team of students.
2. Place the Data Sheet #1 and Data Sheet #2 and 6 sheets of paper inside a file folder for each team.

Introduction for Students

Geologists who study other planets cannot travel to the planets and examine the rocks in person; instead, they conduct scientific analysis using data and images from spacecraft and rovers. When planetary geologists begin to look at new images from a planetary surface, they often pose a question that they want to solve, make observations related to that question, analyze and interpret their observations, and then make conclusions based on their analysis of the observations. If you were a geologist studying Mars, what would be the questions that you would want to answer? How would you answer those questions?

In order to find the answer to a question, you should make observations, predict or hypothesize your findings, make related observations, analyze these observations, and then come to a conclusion. Data Sheet #1 lists these five steps.

Procedure

1. Students should work in teams and use the two images (or another data set chosen by the teacher) to go through the process of posing and answering questions.
2. Students should use one sheet of paper in their file folder to list all of their questions and then choose one to answer. The remaining five sheets are for each of the steps, writing down their observations on one, predictions on the second, related observations on the third, analysis and interpretation on the fourth, and conclusion on the fifth.
3. A summary of each of these five sheets should be written into the numbered boxes on Data Sheet #2.
4. The Data Sheet #1 should be attached to the outside of the front cover of the file folder; the six pages should be clipped with a paper clip or button-tab and placed in the file folder; and Data Sheet #2 should be attached to the inside front cover of the file folder.

Process/Closure

This is exactly the process by which planetary geologists analyze images from other planets. Choose another question on the list generated by each team to be answered and repeat the process. Add the results to each team's Mars Data Analyzer file folder.

Extension/Enrichment

Make a series of analyses of each of the general topics covered in this guide. Questions could include the following topics: physical properties of Mars, surface of Mars, the atmosphere of Mars, missions to Mars, the MER mission.

Choose two other images from the Mars image file on this CD or from other sources. Images can be from orbiter spacecraft, rover, or close-up microscopic imager. For older students, maps or chemical data from one of the MER spectrometers could also be used.

Credits: This activity was created by Judy Stanley, LodeStar Astronomy Center.

MARS FACTS

About one hundred years ago, astronomers studying Mars through Earth-based telescopes thought they could see numerous long, straight lines on the surface of the planet. Italian astronomer Giovanni Schiaparelli called them **canali**, Italian for channels or grooves. Others translated the word as canals and considered them to be evidence of an intelligent civilization. We now know that these lines were actually a pattern of light and dark areas on the surface of Mars (called albedo markings by astronomers) caused by deposits of wind-blown dust. The darker areas usually have less dust cover.

Look at these dark marks through half-closed eyes and your brain will try to see a pattern of interconnected dark lines. This is what fooled the nineteenth-century astronomers.

Mars Data Analyzer: The Scientific Process

Data Sheet #1

Student Name(s):

Date: _____

1. Observe

Look, compare, and contrast the details of the surface of Mars. Record only the details you can actually observe.

2. Question

Based on the details you have observed, ask a question about the surface of Mars.

3. Study the Images/ Make Related Observations

What will you do to try to answer your question? What data can you use?

4. Record Data

Record your procedures and results. How will you organize and present your data?

5. Interpret the Data

Examine the data you have recorded. What does it mean? Examine all possibilities. Where does the evidence point?

6. Conclusion, Answer, and Additional Questions

Based on all the data, draw conclusions and answer your question. Add additional questions.

Mars Data Analyzer: Mars Surface Science

Data Sheet #2

Student Name(s):

Date: _____

1. Observe

2. Question

**3. Study the Images/
Make Related
Observations**

4. Record Data

5. Interpret the Data

**6. Conclusion, Answer,
and Additional
Questions**

Mars Data Analyzer: Mars Surface Science

Data Sheet #2

Student Name(s): _____

Date: _____

1. Observe

2. Question

3. Study the Images/Make Related Observations

4. Record Data

5. Interpret the Data

6. Conclusion, Answer, and Additional Questions

The Spirit Rover Landing Site



The Opportunity Rover Landing Site

