

Strange New Planet

Teacher Version

Adapted from NASA's "Mars Activities: Teacher Resources and Classroom Activities – Strange New Planet" at mars.jpl.nasa.gov/classroom/pdfs/MSIP-MarsActivities.pdf

Introduction & Purpose

This activity will help your students further understand the processes involved in planetary exploration by demonstrating how planetary features are discovered through the use of remote sensing techniques.

Objective

Students will be engaged in making multi-sensory observations, gathering data, and simulating spacecraft missions.

Materials Needed

- A "Planet," which can be created from any one or more of the following materials:
 - Plastic balls
 - Modeling clay and/or Playdoh®
 - Inflated balloons
 - Styrofoam® balls
 - Round fruit – such as a cantaloupe, pumpkin, orange, grapes, etc.
- Vinegar, perfume, or other scents
- Small stickers, sequins, candy, marbles, or other small, interesting items
- Cotton balls
- Toothpicks
- Objects that can be pierced with a toothpick to make a moon
- Glue (*if needed*)
- Towel (*to drape over planet*)
- Pins or tacks
- A "Viewer" per student, such as empty paper towel or toilet paper rolls
- A 5" x 5" blue cellophane square per student
- One rubber band per student
- Masking tape to mark the observation distances
- Student data collection questions (in the **Student Version**)
- Pens or pencils
- Idaho TECH Lab Notebook

Procedure

1. **Selecting a planet** – Create a planet in the absence of the students. Choose an object such as a plastic ball or fruit (cantaloupe, etc.) that allows for multi-sensory observations. Decorate the object with stickers, scents, etc. to make the object interesting to observe. Some of the materials should be placed discretely so they are not obvious upon brief or distant inspection. Some suggestions for features are:
 - ★ Create clouds by using cotton and glue
 - ★ Carve channels in the ball (if possible)
 - ★ Attach a grape using a toothpick (to make moons or orbiting satellites)

- ★ Affix small stickers or embed other objects into the planet
 - ★ Apply scent sparingly to a small area
2. **Set-up** - Place the planet on a desk in the back of the room, and cover the planet before allowing the students into the classroom. Brief the students on their task: To explore a strange new planet. Explain that their exploration will occur in a series of phases, just like space exploration. There will be four phases: (1) pre-launch reconnaissance; (2) a fly-by mission; (3) an orbiter mission; and (4) a lander mission. Have the students construct viewers by using empty paper towel or toilet paper rolls, or by rolling loose-leaf paper into a tube. These viewers should be used at all times when observing the planet. Sometimes, the students will be limited as to how close or for how long they can make observations. Explain that this is how the various phases of space exploration will be simulated. Also, make sure students have their student data collection questions, which are located in the Student Activity Book – one set for each phase of the exploration. Encourage use of all senses during observation, except taste unless specifically called for.



a. **Pre-launch Reconnaissance**

The first phase simulates Earth-bound observations. Arrange students against the side of the room, far away from where the planet sits (it should still be covered at this time). This area where the students are standing will be referred to as **Mission Control**. A blue cellophane sheet should be placed on the end of the viewers, taped or held in place by a rubber band. The cellophane helps simulate how objects appear when viewed through Earth's atmosphere. Once the students have fitted their viewers with the cellophane paper, remove the towel and expose the planet. Have the students observe the planet for one minute. Replace the towel after time expires. Let the team then discuss and record their observations of the planet in their Lab Notebook. At this point, most of the observations will be visual and will include color, shape, texture, and position. The team should also compose questions to be explored in the future fly-by, orbiter, and lander missions.

b. **Mission 1: The Fly-by** (*Mariner 4 in 1965, Mariner 6 & 7 in 1969*)

Have the students remove the cellophane from their viewers. Now the team will have one chance to quickly walk past one side of the planet and observe it through their viewers (the other side should remain draped under the towel). A distance of five feet from the planet must be maintained during this "fly-by." Once the fly-by is complete, replace the towel over the entire planet, and have the team reconvene at Mission Control. Have the team record their observations in their Lab Notebook and discuss what they will look for on their next mission (inform the students that the next mission will be an orbiter mission).

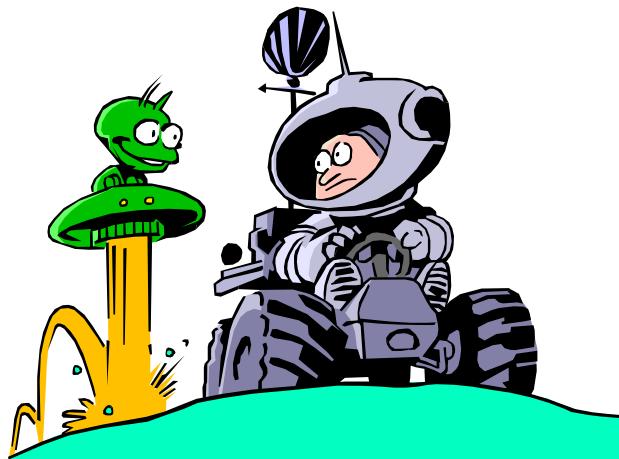
c. **Mission 2: The Orbiter** (*Mariner 9 in 1971-72, Viking 1 & 2 Orbiters in 1976-80, Mars Global Surveyor in 1996-present, 2001 Mars Odyssey in 2001-present, Mars Express Orbiter in 2003-present*)

During this mission, the team has a total of two minutes to orbit (circle) the planet, one person at a time, at a distance of two feet. You might want to help them determine how long each member has to orbit, so everyone has the same amount of time for observation. While orbiting, have the students observe distinguishing features through their viewer and record this data back at Mission Control. The team will need to develop a plan for their landing mission using this data and previously collected information. The plans should include the

landing site and features to be examined once on the planet. Have the students record these plans in their Lab Notebook.

d. **Mission 3: The Lander** (*Viking 1 & 2 Landers in 1976-82, Mars Pathfinder in 1997, 2003 Mars Exploration Rovers in 2003-present*)

On this mission, the team will approach their landing site and mark it with a pin or tack, or masking tape if the planet will pop by using a pin. Team members will then take turns observing the landing site with their viewers. The team has a total of five minutes to make these observations. Again, you may want to help them determine how long each member has to view the landing site. Field of view is kept constant by the team members aligning their viewers so the pin is on the inside and top of their viewers. Within this field of view, students should enact their mission plan. After five minutes, have the team return to Mission Control to discuss and record their findings in their Lab Notebook.



Debriefing

Now that the team has simulated planetary exploration through several different missions, have them think about which phases were more conducive to making different kinds of observations.

- Which planetary features were easiest to observe at each phase?
- Which features were more difficult to observe?
- Did different team members notice different features than other members?
- Was it necessary to complete all phases of the mission before being able to accurately describe the planet?
- Is further exploration necessary?
- What would they like to explore on this planet with a rover mission?
- What kinds of tests would they like to perform on the surface?
- How did they formulate their plans for exploration?
- How did they choose their landing site?
- What factors did they consider?
- Was it difficult to come to consensus while making such decisions?
- Tie this activity to any activities the team has already completed that addresses topography, mission planning, or landing site choice.