

# Lesson 5

## Strange New Planet

### GRADE LEVEL(S)

4 – 6

### LENGTH

45-90 minutes

### MATERIALS

- Giant Destination Mars Map
- Base for creating planet (plastic balls, modeling clay, Play-doh®, Styrofoam® balls, round fruit, etc.)
- Small, interesting objects and materials to create planet (stickers, sequins, candy, marbles, cotton balls, etc.)
- Scents (vinegar, perfume, etc.)
- Toothpicks and objects that can be pierced by them to create moons
- Glue, push-pins
- Towel (to cover each created planet)
- Material for viewers (paper towel or toilet paper rolls, colored cellophane squares, and rubber bands)
- Masking tape
- Student data sheet

### VOCABULARY

- Reconnaissance
- Mission Control
- Atmosphere

### ESSENTIAL QUESTION(S)

How has remote sensing been used to learn about Mars?

### LESSON OBJECTIVE(S)

Students will learn:

- How to make observations about Mars exploration
- How to gather data
- How to simulate a spacecraft mission

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### ENGAGEMENT

1. Choose an object, such as a plastic ball or round fruit, that allows for multi-sensory observations. Decorate the object with stickers, scents, etc. to make the object interesting to observe. Some of these materials should be placed discreetly so that they are not obvious upon brief or distant inspection. Use the Mars Map for inspiration. *Some suggestions for features: create clouds by using cotton and glue; carve channels; use toothpicks and smaller, pierced objects to create moons or orbiting satellites; affix small objects, stickers, etc. into the planet; apply scent sparingly to small area.*
2. Place the object (planet) on a desk on the back of the Mars Map. Cover the object with a towel before students arrive. Brief students on their task: To explore a strange new planet. Students can construct viewers out of loose-leaf paper by rolling the shorter side into a

tube (can also use toilet paper roll or paper towel roll.) These viewers should be used whenever observing the planet. Form mission teams of 4-5 students. Make sure students have a place to record their data (student data sheets.) Encourage use of all senses (except taste unless specifically called for).

3. This step simulates earth-bound observations. Arrange students on the outsides of the Map by teams. These areas will be referred to as Mission Control. To simulate Earth's atmosphere, a blue cellophane sheet could be placed on the end of the viewers, taped or held in place by a rubber band. This helps to simulate the variation that occurs when viewing objects through the Earth's atmosphere. Remove the towel. Teams observe the planet(s) using their viewers for 1 minute. Replace the towel. Teams can discuss and record their observations of the planet. At this point, most of the observations will be visual and will include color, shape, texture, and position. Teams should write questions to be explored in the future missions to the planet.

### EXPLORATION

1. Each team will have a turn at walking quickly past one side of the planet (the other side remains draped under towel). A distance of five feet from the planet needs to be maintained. Teams then reconvene at the sides of the room (Mission Control) with their backs to the planet while the other teams conduct their fly-by. Replace towel over planet once all the fly-bys have taken place. Teams record their observations and discuss what they will be looking for on their orbit mission.
2. Each team takes two minutes to orbit (circle) the planet at a distance of two feet. They observe distinguishing features and record their data back at Mission Control. Teams develop a plan for their landing expedition onto the planet's surface. Plans should include the landing spot and features to be examined.
3. Each team approaches their landing site and marks it with a push pin (or masking tape if planet will pop using a pin.) Team members take turns observing the landing site with the viewers. Field of view is kept constant by team members aligning their viewers with the push pin located inside and at the top of their viewers. Within the field of view, students enact the mission plan. After five minutes, the team returns to "Mission Control" to discuss and record their findings.

### EXPLANATION

1. Each individual student should complete a Student Data Sheet. Each team shares their data with the class in a team presentation. As a class, compile a list of all information gathered by the teams to answer the question "What is the planet like?" (or each planet if multiple planets are used). Have the class vote on a name of the newly discovered planet or the geologic features discovered. Teams should also critique their depth of observations and ability to work together.

### EXTENSION

1. Ask students to select another planet in our solar system and research the amount of time it would take to do a Fly-By to gather photographic evidence of the planet. Ask students to share their findings and discuss why space travel is one of the most difficult but important endeavors for our society.
2. Ask students to make an entry in their STEAM notebooks regarding what they learned and observed in each phase of this lesson.

## EVALUATION

1. During this lesson, the teacher is encouraged to use formative assessment such as questioning and examining student responses/notes throughout the lesson to elicit evidence of learning and deepen student understanding. Teachers may wish to grade student handouts and/or review students' STEAM notebooks to formally assess student understanding.
2. Teachers are encouraged to create their own grade-level and ability-level assessment so as to best meet the needs of their students.

Name: \_\_\_\_\_

# Strange New Planet Student Data Sheet

## A. Pre-Launch Reconnaissance - Earth-bound observations

- 1) Estimate your distance from the planet: \_\_\_\_\_ (feet or meters).
- 2) Using your viewer (with blue cellophane attached to simulate Earth's atmosphere) observe the planet. What types of things do you observe? Record any observations (shape of planet, color, size, etc.)
- 3) Discuss all of the observations with your team members while at Mission Control. Record any team observations that differ from yours.
- 4) As a team, write questions to be explored in the future missions to the planet. What else do you wish to know and how will you find that information out (special features of the planet, life of any kind, etc.)
  - a.
  - b.
  - c.
  - d.

## **B. Mission 1: The Fly-by (Mariner 4, 6, 7 - 1965,1969,1969)**

Using their viewers (with the cellophane removed), each team will have a turn at walking quickly past one side of the planet. A distance of five feet needs be maintained from the planet. Teams will then meet back at Mission Control with their backs to the planet until all teams have completed their fly-by of the planet.

1) Record your observations of the planet. What did you see that was the same as your Earth observations? What did you see that was different? Can you hypothesize (make a science guess) as to why there were any differences?

2) Record any similarities or differences that your team observed.

3) List the team ideas as to what you want to observe on your next orbiting mission.

a.

b.

c.

d.

**C. Mission 2: The Orbiter** (Mariner 9, 1971-72; Viking I and 2 Orbiters, 1976-80; Mars Global Surveyor, 1996-present)

Using a viewer, each team takes a total of two minutes to orbit (circle) the planet at a distance of two feet. Divide the two minutes by the number of team members to get the time each person gets to orbit the planet. After your observation, return to Mission Control.

1) Record your observations of the planet. What did you see that was the same as your Earth or fly-by observations? What did you see that was different? Can you hypothesize (make a science guess) as to why there were any differences?

2) Record any similarities or differences that your team observed.

3) As a team, develop a plan for your landing expedition onto the planet's surface.

a. Where will you go and why? How did your team decide where to land?

b. What are the risks or benefits of landing there?

- c. What specifically do you want to explore at this site?
  
- d. What type of special equipment or instruments would you need to accomplish your exploration goals? (Remember, anything you bring has be small and light enough to bring on a spacecraft!)

### **D. Mission 3: The Lander** (Viking 1 and 2, 1976-1982; Mars Pathfinder 1 1997)

Each team will approach their landing site and mark it with a push pin or masking tape. Each team member will take a turn observing the landing site through their viewer. Field of view (the area that you can see through your viewer) is kept constant by aligning the viewer with the push pin located inside and at the top of their viewers. Each team has a total of five minutes to view the landing site. After each member views the landing site, return to Mission Control.

1) Now that you have landed, what do you think you can accomplish at this landing site?

2) How long (in days) will it take you to get the job accomplished?

3) Was your mission successful? Why or why not?

4) What were the greatest challenges of this mission (Personally and as a team)? What would you change for the next mission?

5) List the members of your team.