

## Lesson 8: Blind Mice

This lesson is adapted from “Strange New Planet,” an activity in The Mars Activity Book, by the Mars Education Program at Arizona State University (<http://marsed.asu.edu/pages/pdfs/MSIP-MarsActivities.pdf>)

**Purpose: To expand student understanding that combining information gathered by a variety of robots gives us a more comprehensive understanding of our Solar System.**

### Standards

#### NCTE/IRA Standards for English Language Arts

**Standard 1-** Students read a wide range of print and non-print texts...to build and understanding of themselves [and] acquire new information.

**Standard 5-** Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes.

**Standard 12-** Students use spoken, written, and visual information to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information).

#### National Science Education Standards

##### Science as Inquiry – Content Standard A

1. Abilities necessary to do scientific inquiry.
2. Understanding about scientific inquiry.

##### Physical Science – Content Standard B

1. Properties of objects and materials- objects have many observable properties such as size, shape, and color,
2. Position and motion of objects- the position of an object can be described by locating it relative to another object or the background.

##### Science and Technology – Content Standard E

1. Understanding about science and technology – scientists and engineers often work together in teams.
2. Understanding about science and technology – tools help scientists make better observations.
3. Abilities to distinguish between natural objects and objects made by humans – some objects occur in nature; others have been designed and made by people to solve human problems.

### Overview

Our knowledge of Mars increases with every robotic spacecraft we send to investigate the red planet. Early ground-based telescopic observations by Cassini, Schiaparelli, Lowell

and others showed dark regions on Mars (that until 1965 were believed to be vegetation) and polar caps, changing in size with the seasons. Ground-based telescopic observations also gave early estimates of the rotational period of Mars. Some observations led to the speculation (and strong belief by some) that intelligent life existed on Mars. However, the past 40 years of exploring Mars with robotic spacecraft flying by, orbiting and landing on Mars has shown us a cold, dry, desert world with no sign of liquid water, vegetation, or intelligent life. Advances in technology have allowed us to build better robotic spacecraft that have helped us gain a better understanding of Mars and the Solar System. In this activity, students will gain an understanding of how knowledge of planets and their characteristics increases with the use of better technology.

Part One of the lesson will address how man uses previous knowledge to understand and interpret new situations. Often our understandings must be altered to accommodate new observations and findings. Part Two of this lesson will help the students understand that observations from far away (ground-based telescopes) can provide information about the entire planet, but with little detail. Flyby and orbiter observations provide information about the planet as a whole but still leave many unanswered questions. Landers give us greater detail but only of the selected landing site.

### Understandings

1. Robots gather different information (data) depending on their design and use.
2. Combining the information (data) gathered by a variety of robots gives us a broader and more in-depth understanding of our Earth and Solar System.

- Our knowledge and understanding of our Earth and Solar System changes and/or expands as new discoveries are made.

## Materials

- Seven Blind Mice by Ed Young, ISBN 0-698-11895-2
- Viewers (one per pair of students): paper towel tubes with 3 x 3 inch blue cellophane squares attached to the end with rubber bands
- One or more “planet(s)” formed out of different colors of play dough (see recipe in Lesson 3: Play dough Planets). Create land formations (volcanoes, riverbeds, and craters) and add decorations (glitter, pipe cleaners, beads, stickers, etc.) to simulate geologic and inhabitant features.
- A small towel to cover each of the “planets”



## Time

Preparation time for forming “planets” and making Viewers: 45 minutes

Part One: 20-30 minutes

Part Two: 45- 60 minutes

## Directions

### Part One

- Read Seven Blind Mice to the students.
- Discuss what each mouse thought and why the combined opinion was more accurate.
- Extend the discussion to our exploration of other worlds and the concept of combining a variety of

information (data) to achieve a better idea of what the planet is like. *Discuss how the ancient Greeks could only observe Mars as a point of light that moved across the sky. It was not until Galileo first observed Mars through a telescope that humans began to see Mars as more than a point of light.*

### Part Two

- Background information: *Over 4,000 years ago civilizations were observing Mars with only their eyes. At first people believed that Mars was just a red star. Then after observing that the star moved they started calling it a planet, which is Greek for wanderer. The invention of the telescope in the 1600s gave astronomers a better view of Mars as a planet. However, ground-based observations were restricted by the incredible distance separating Earth and Mars and the effect of viewing through the Earth’s atmosphere. Many people believed that there was a detailed canal system and some strongly believed these canals proved the existence of intelligent life on the red planet. Space-based telescopes, such as, the Hubble Space Telescope gives researchers better views from Earth-orbit by being outside of the Earth’s atmosphere but there is still an incredible distance of at least 55 million kilometers (35 million miles) between the two planets. In 1964, NASA launched a robot, Mariner 4 to fly by Mars giving scientists their first up-close look at the red planet. Mariner 9 was the first spacecraft to orbit Mars sending back many pictures. By now scientists realized that Mars was a cold, dry, desert world.*

*Viking 1 was the first robot to land on another planet successfully. In 1975, Viking touched down on the Martian surface giving scientists even more information. Current robotic missions to Mars are continually improving our knowledge and understanding of Mars, helping give us a better picture of the “elephant” of Mars.*

2. Discuss with the students what type of information we receive from ground-based telescope observations, orbiting telescope observations, flybys, orbiters and landers and how all types of robotic spacecraft have given us more knowledge and a better understanding of Mars and the rest of our Solar System. *You can tie this back to the Seven Blind Mice book.*
3. Pair up students into observing teams. *Explain to students that they are Scientists who are observing a newly discovered planet in our Solar System.*
4. **Role Play** Teacher: “Your observing team has written a proposal and has been approved for observing time at a ground-based telescope. Your team will be recording its findings in preparation for future exploration funding proposals.”
5. Have the students simulate ground-based telescopic observations. Arrange students in pairs on opposite side of room from the planet and distribute one “viewer” to each pair. One student will be the Observer and the other will be the recording Scientist. *Discuss with the students how the Earth’s atmosphere affects such observations. The Earth’s*

*atmosphere is a layer of gases that surrounds the Earth which regulates temperatures and blocks the Earth from harmful radiation, which is good for protecting life on Earth. However, the atmosphere blurs images and makes it difficult to study objects in space.*

6. Have all the students turn their backs to the “planet.” Uncover the planet and have the Observer turn around and view the planet through their viewer for 15 seconds. Cover the planet and have the Observer describe their observations to the Scientist. The Scientist records the observations. Students may choose to record observations with words and/or pictures.
7. Students reverse roles and repeat step 6.
8. Discuss observations. What knowledge was gained about the planet?
9. **Role Play** Teacher: “Congratulations! Because of your fine ground-based observations your team has been approved for time on a space-based telescope.”



10. Have students resume original roles, repeat steps 6 & 7 without cellophane. This is a simulation of observations made from a space based telescope such

as Hubble Space Telescope. Have scientists record the observations.

11. Discuss observations. Was any additional knowledge gained about the planet? Can you compare and contrast the ground-based and space-based observations? *Review with the students the effect of the atmosphere in telescopic observations.*
12. **Role Play** Teacher: “Fantastic work! Your team’s initial observations provided new knowledge about this unknown planet and have generated the quest for additional knowledge. NASA has agreed to fund a flyby!”
13. Have students resume original roles. Have Observers line up and prepare for a planetary flyby. Scientists should turn their backs to the covered planet. Explain to the Observers that they will be following each other as they pass by the new planet. They will be observing the new planet through their viewing tubes. This simulates the view of the spacecraft’s camera. After all Observers have “flown by” the planet, cover and have them relay to the Scientists what they observed for the Scientist to record the observations.
14. Students reverse roles and repeat step 13.
15. Discuss findings. Did you gain any additional knowledge from this flyby? Would this information have been gained through a telescope observation? Did your flyby observation cause you to wonder more about this new planet? How could additional knowledge be gained about this planet?
16. **Role Play** Teacher: “Outstanding teamwork! Once again NASA has agreed to fund an additional mission. Your team will be orbiting the new planet.”
17. Students resume original roles. Have Observers line up and prepare for a planetary orbit. Scientists will turn their backs to the covered planet. Explain to the Observers that they will be following each other as they circle the new planet. They will continue to view the planet through the viewing tubes. Once they complete one orbit they are to return to the Scientist and relay their findings for the Scientist to record.
18. Students reverse roles and repeat step 17.
19. Discuss findings. Did you gain any new knowledge? Did this observation generate any new questions? How did the flyby and orbital observations differ?
20. **Role Play** Teacher: “Newsflash! We interrupt this activity for a NASA update. NASA has selected your team to send a lander to this new planet. Your team must select a landing location based on your previous observations. Keep in mind that if your lander crashes the mission is lost.”



21. Students resume original roles. Have Observers line up and prepare to land on the planet. Give teams time to select their landing site. Scientists will turn their backs to the covered planet. Observers will need to approach the covered planet one at a time, indicate their chosen landing site and view it through the viewer. Only uncover that portion of the planet and allow ten seconds for viewing. Return to the Scientist and relay findings for the Scientist to record.
22. Students reverse roles and repeat step 21.

23. Discuss findings. Did you gain additional knowledge about the planet? What are the advantages/disadvantages of a lander?
24. Lead the students in a discussion giving pros and cons of each of these forms of observation/exploration. Help the students understand the importance of using a variety of observation/exploration methods to gain a broader and more in-depth understanding of our Earth and Solar System.

### **Extension**

Create more than one planet for this lesson.

After steps 8, 11, 15, and 19, teams could write a proposal to fund further exploration of the new planet.

Students could write a persuasive article in favor of funding future NASA missions.