Mars Curriculum

6th through 8th grades, 45 minutes

Notice

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Objectives

Students will learn:

- Basic definitions of the words “planet” and “orbit;”
- How to recognize Mars and other planets in the night sky;
- Some of Mars' physical characteristics; and
- About past and future missions to Mars.

Materials required

- Flashlight and extra batteries
- Laser and light pointers
- Props to represent Earth and Mars in scale model *[Note: Earth's diameter is about twice Mars' diameter]*
- Digitarium™ system set to current date and time, with atmospheric effects and landscape turned on

I. Introduction *(5 to 10 minutes)*

A) Inform students that you'll be learning about the planet Mars today. You'll discuss some topics outside the planetarium, then go inside to learn more. Inside students will observe tonight's sky, learn to find Mars and other planets in the sky, and observe the motion of Mars over time.

B) Assess students' knowledge. What is a planet? The Facts on File Dictionary of Astronomy defines a planet as, 'A body that orbits the Sun or another star and shines only by the light that it reflects.' Discuss with students what this means; for example, what 'orbits' tells you, what 'reflects' means, etc.

Note: The above is a very simple and broad definition. If students are interested, discuss the August, 2006 International Astronomical Union definition of a planet (an object that is in orbit around the sun, is large enough for its own gravity to pull it into a nearly spherical shape, and has cleared the neighborhood around its orbit). Why did this definition change Pluto's status to a dwarf planet?

C) Share some Mars facts with students. For example:

- Use Earth and Mars props to show how the two compare in size.
- Explain why Mars is nicknamed the Red Planet.
- Mars is named for the god of war, though in early Roman history Mars was a god of agriculture. The Greek name for Mars is Ares.
- The name of the month March derives from the name Mars.
- In Romance languages the word for Tuesday is derived from Mars (martes in Spanish, mardi in French, etc.).
- See http://seds.lpl.arizona.edu/nineplanets/nineplanets/mars.html for more interesting Mars facts.

D) Prepare students for entering the planetarium--method of entry, rules for behavior, etc.

II. Recognizing planets in the sky *(10 to 15 minutes)*

A) *[When all are in and seated, speed up time to let the sun set, then turn off atmospheric effects and landscape.]* Before you start looking for Mars in the real night sky, it will be helpful to know which direction is which. If you're observing the sky of the northern hemisphere, there's one star in particular that will help you find your directions: Polaris, the north star. Use the Big Dipper and 'pointer stars' to find Polaris, then review the other directions in the night sky. Display the cardinal points to help students remember the directions.

B) Outside the dome you discussed the major differences between planets and stars. One difference was that stars create light while planets merely reflect it. How could you tell that something was reflecting light rather than making it? While students might think reflecting light would make planets dimmer than most stars, that's not the case with many of the planets *[all but Uranus and Neptune, which require a telescope to be seen; Mercury is so close to the sun that it is hard to see but can be seen without a telescope]*. Remind them that all stars except the sun are farther away from Earth than are the planets, and lead them to the fact that planets are often brighter in our night sky than stars. Venus and Jupiter are particularly bright.

C) Ask students to predict what they think are planets in the sky. Have three students use a LIGHT pointer to point to their predictions; each student can assign a name to his/her potential planet, or you can just name the planet after the student— .e., 'planet Joey.' *[Note: You may want to display and define the ecliptic to make success more probable.]*

D) Ask students how we'll figure out whether or not those things are planets, leading them back to the idea that a planet orbits a star. If we advance or regress in time, the potential planets should have different backgrounds than they do with the current setting. Make sure everyone remembers which planet candidates are being observed by pointing them out once more.

E) Move forward in time week by week until two or three months have passed *[or run several seconds of the annual motion software script]*. Did the candidates move against the background of stars? If so, then they were in fact planets! If not, they were stars. Discuss which planets or stars they were, but **do not turn on planet labels yet**.

III. Mars (10-15 minutes)

A) Now that we have an idea of which objects are planets, how can we figure out which is Mars? Remind students that Mars is nicknamed the “Red Planet.” *[Display the ecliptic if it is not already on.]* Anybody think they see Mars in the sky? *[You may need to speed up time to bring Mars above the horizon.]*

B) Zoom in on Mars, speed up time to watch it rotate, and discuss interesting surface features, pausing when/if they become visible: polar ice caps, Valles Marineris, Olympus Mons, etc. Show supplemental images and/or videos to discuss features too small to be viewed with the software.

C) Discuss what the rovers Sojourner, Spirit, and Opportunity have found on Mars. Show images of the rovers as well as what they found on the surface.

D) Ask students what challenges were involved in getting the rovers to Mars *[determining Mars' position in order to time the launch and plan the trajectory; deciding how to safely land the rovers without a human to guide them; etc.]*. What challenges did scientists face after the rovers were on the surface of Mars? *[Long lag time for signals to travel between Mars and Earth—at least eight minutes each way; Mars' day is longer than Earth's by about 40 minutes; etc.]*

E) Discuss future missions to Mars. Would the students want to be on these missions? What are the benefits of human exploration versus robotic? What added challenges are involved with sending humans instead of robots?

F) **OPTIONAL:** Discuss myths/misconceptions about Mars, such as the canals and the (in)famous "Face on Mars." Show supplementary images.

G) **OPTIONAL:** Change your viewpoint to the surface of Mars *[use the Mars panoramic landscape to heighten the effect]* or to one of its moons. How do students expect the new viewpoint to affect their view of the stars? Of the other planets/moons? Solicit and test predictions.

I) Prepare students for exiting the planetarium, with instructions to regroup outside.

IV. Conclusion *(5 to 10 minutes)*

A) When all are seated outside the planetarium, review how to find planets in the night sky. How will they recognize Mars? Remind students when Mars is visible in the current night sky (or in the near future's night sky if it is currently only visible during the daytime). What else did they learn about Mars?