William M. Staerkel PLANETARIUM

Teacher's Guide for:

Our Place in Space

OBJECTIVES:

- To find a few of the constellations in our current night sky.
- To discover why our Moon appears to change shape or phase.
- To see what factors come into play for us to observe both a lunar and a solar eclipse
- To see the significance of the North Star, Polaris.
- To investigate how we know the Earth is round
- To observe how apparent brightness is related to distance

This show conforms to the following Illinois state science standards: 12.F.1a, 12.F.1b, 12.F.2a, 12.F.2b, 12.F.2c, 12.F. 3a, 12.F.3b. This show matches the Champaign Unit #4 4th grade curriculum. Next Generation Science Standards: 1ESS1.1, 5PS2.1, 5ESS1.1, 5.ESS1.2

BRIEF SHOW DESCRIPTION:
From "our place in space," on the Earth, we can observe many things in the night sky. As the Sun sets in our planetarium dome, we play "connect the dots" and observe a few of the more well-known constellations. But we notice that some points of light in the sky move over time. We look at our current planets visible from your yard tonight and then examine the changing phases of our Moon.. Emphasis here is on how the Moon appearance is based upon our viewing perspective. We examine evidence for a round Earth (how mountains sink into the ocean, how the stars change with latitude, and the Earth's curved shadow in a lunar eclipse) and look at the reason the North Star is so special. Students are encouraged to go out and see and *measure* these things for themselves.

Since this is a live show, the teacher is encouraged to make requests depending on class focus. The show thrives on interaction between the presenter and the students.

PRE-VISIT ACTIVITIES/TOPICS FOR DISCUSSION:

1. Discuss with the class what events we can see in the sky from our backyards. Your list may include the Sun's apparent motion across the sky and the changing shape of the Moon.
2. Ascertain student misconceptions regarding phases of the Moon. Ask why the Moon seems to change shape? You'll find that many will maintain that the dark part of the Moon is the Earth's shadow. A trip outside during a third quarter Moon (when the Moon can be seen in the daytime) will let the student see where the Moon is and that their shadow is behind them, away from the Sun. Similarly, the Earth's shadow is always opposite the Sun.
3. Discuss how we know the Earth is spherical? Even if you see photos taken in space, the Earth could still be a pizza pan in the photo (round, yet flat)! So that's not a good

answer! It is actually difficult to show that Earth is round but the discussion will bring this fact to light!

4. Use a digital camera to shoot a photo of streetlights at night. If we assume that all streetlights are the same brightness, what can we ascertain from the photo that shows some streetlights appearing fainter?

POST-VISIT ACTIVITIES/TOPICS FOR DISCUSSION:

1. Model the Moon phases by letting each student "be" the Earth. This could be done individually by constructing Moons for everyone (styrofoam balls on tongue depressors or ping pong balls glued to golf tees work nicely) or by letting one student be the Moon and one be the Earth. Use a light source (lamp without the shade) in a dark room. As the Moon moves around the Earth (you!), you can see it change phase. You can also position the Moon so that it blocks out the light source (solar eclipse) or so that it falls in your shadow (lunar eclipse). Note that, with the exception of a lunar eclipse, the Moon is always half lit.
2. Construct a "Lunar Log" by making drawings of the Moon noting its phase and position. A simple sheet with circles and places for a date and time of observation works great. Be sure to instruct students if they are shading in the lighted side they see or the dark side.
3. When is the next eclipse? And will we be able to see it from Central Illinois? Check out Fred Espenak's web page in resources below and get probably more information than you'll ever need!
4. Why do we say the Earth is a sphere but yet it appears flat? The key is the size. Bring in different sized spheres into class. Hand certain kids a BB, a marble, a tennis ball, a baseball, a softball, a basketball and, if you can find one, a beach ball. You have to hold the ball in one hand with your palm facing down (though you can cheat with a hand on the bottom of the ball for the last two examples). Look what happens to your palm as the size of the ball gets larger. It gets flatter! In fact, your palm is pretty flat when holding the beach ball. Then think about how much larger the Earth is than a beach ball!
5. If you have a sunny window, tape an "X" on the window so that it casts a shadow on the floor. What does the shadow do over several hours. What's happening (Earth's rotation)? If you do this near the start of the school year and then once before break, the path made by the Sun won't be the same. When is it higher in the sky? Lower? You can also measure the length of a shadow of something like a telephone or light pole. You can also note the times of sunrise and sunset in the newspaper - are they the same all year around? Notice the trends!

VOCABULARY WORDS:

Constellation Gibbous Lunar Eclipse
Solar Eclipse
Milky Way

INTERNET RESOURCES:

- "Ask Starman" send email to: dleake@parkland.edu

- Working group on astronomical education: http:www.aas.org/~wgae
- Abram's Sky Calendar: http://pads1.pa.msu.edu/abrams/home.html
- Current space missions: http://www.jpl.nasa.gov/
- Moon phases: http://www.googol.com/moon
- NASA's Eclipse home page (from Fred Espenak): http://eclipse.gsfc.nasa.gov/eclipse.html
- Astronomy internet applets: http://astro.unl.edu/naap/
- You can print star charts for each season from the planetarium web site