Kinesthetic Astronomy

The Moon Phase Lesson

Summary

This lesson employs kinesthetic activities to help people learn about the phases of the Moon. It dispels the misconception that lunar phases are caused by the Earth's shadow on the Moon, which only occurs during a partial or full lunar eclipse. This lesson uses the same structural set up as Kinesthetic Astronomy: The Sky Time Lesson. That lesson will be referenced throughout this lesson.

Audience

Middle School through Adults

Time Allocation

1.5 hours

Materials

All Kinesthetic Astronomy Sky: Time Lesson Props

8 Moon Phase Shirts

Earth Globe Shirt (optional)

Standards

EARTH AND SPACE SYSTEMS

SC4.1.5 Objects in the Sky: Students describe observable objects in the sky and their patterns of movement.

SC4.1.6 Changes in Earth and Sky: Students describe observable changes in earth and sky, including rapid and gradual changes to the earth's surface, and daily and seasonal changes in the weather.

Lesson

Section 1: The Sky Time Lesson

1. Follow the instructions found in the Kinesthetic Astronomy Teacher's Guide for setting up Kinesthetic Astronomy: The Sky Time Lesson.
2. Complete Sections IIa #1 through Section IIb # 52 with your students.

Section 2: The Moon Phase Lesson

A. Introduction

3. Remove the constellation signs and walk about 50 ft away from the balloon Sun.
4. Take out the 8 Moon Phase Shirts and the Earth Globe Shirt. Assign them to 9 volunteers.
5. Arrange the 9 volunteers so that they are making a 20 ft. diameter circle with the Earth in the center. Ensure that they are standing in the correct locations for the lunar phases.
6. Remind the students that the scale of the lunar orbit around the Earth they just created is way off. Reference the small circle that represented the Moon's orbit around the Earth that fit on the palm of your hand in the Sky Time Lesson.
7. Give the student who is representing Earth (Earth Student) the East and West hand paddles.
8. Ask that student a few of the same kinesthetic questions from the Sky Time Lesson to ensure that they realize that everything is still the same as before.
9. Tell the students that for simplicity we are going to assume the same rising and setting times for the Moon as we did for the Sun in the Sky time Lesson (e.g. 6am rising in the east, 12 noon at your meridian, 6pm setting in the west, 12 midnight along your spinal cord).

B. The Illuminated Side of the Moon

10. Ask Everyone: "Does the Moon make its own light?" [No]
11. Ask Everyone: "Where does the Moon's light come from?" [The Sun. All the light that we see from the Moon is reflected Sunlight.]
12. Ask Everyone: "Does the Earth make its own light?" [No]
13. Ask Everyone: "Where does the Earth's light come from?" [The Sun. All the light that astronauts see coming from Earth while they are in space is reflected Sunlight.]
14. Ask Everyone: "How much of the Earth is illuminated by the Sun at any time? [Half]
15. Ask Everyone: "How much of the Moon is illuminated by the Sun at any one time?" [Half. Point out that all the Moon Phase shirts are half black and half white. The white side is the illuminated side which always faces the Sun and the black side is the dark side which always faces away from the Sun.]

C. Full Moon

16. Tell the Earth Student (E.S.): "Go to 6pm".
17. Ask E.S.: "What Moon phase is rising in your east? [A Full Moon]
18. Ask Everyone: "Why is the Full Moon rising in the east at sunset?" [The Sun has to be on the opposite side of the Earth with respect to the Moon for the full illuminated side of the Moon to be seen from Earth. When the Sun is setting in the west, the Moon is rising in the east 180 degrees (on the other side of the Earth) from the Sun.]

19. Ask everyone: “Where is the Full Moon at midnight?” [At your meridian (at the zenith)]
20. Tell E.S. to put the Full Moon at his/her meridian.
21. Ask Everyone: “Where is the Sun when the Full Moon is at your meridian?” [Along your spinal cord]
22. Ask everyone: “Where is the Full Moon at sunrise?” [Setting in the West]
23. Tell E.S. to put the Full Moon in his west.
24. Ask Everyone: “Where is the Sun when the Full Moon is setting in the west?” [Rising in the east]
25. Tell E.S. to put the Full Moon in his west.

D. New Moon

26. Get a new volunteer for the Earth and all the Moon Phases if possible.
27. Tell the Earth Student (E.S.): “Go to 6pm”.
28. Ask E.S.: “What Moon phase is setting in your west? [A New Moon]
29. Ask Everyone: “Why is the New Moon setting in the west at sunset?” [The Sun is on the same side of the Earth with respect to the Moon. The full illuminated side of the Moon is facing away from the Earth.]
30. Ask everyone: “Where is the New Moon at midnight?” [Along your spinal cord]
31. Tell E.S. to put the New Moon along his/her spinal cord.
32. Ask Everyone: “Where is the Sun when the New Moon is at your meridian?” [At your meridian (at the Zenith)]
33. Tell E.S. to put the New Moon at his/her meridian.
34. Ask everyone: “Where is the New Moon at sunrise?” [Rising in the east]
35. Tell E.S. to put the New Moon in his east.
36. Ask Everyone: “Where is the Sun when the New Moon is setting in the west?” [Setting in the west]
37. Tell E.S. to put the New Moon in his west.

E. First Quarter Moon

38. Get a new volunteer for the Earth and all the Moon Phases if possible.
39. Tell the Earth Student (E.S.): “Go to midnight”.
40. Ask E.S.: “What Moon phase is setting in your west? [A First Quarter Moon]
41. Ask Everyone: “Why is the First Quarter Moon setting in the west at midnight?” [The Sun is at a right angle with respect to the Earth and Moon. So, we can only see half the illuminated side of the Moon. The other half of the illuminated side could only be seen if the Earth were on the other side of the Moon.]
42. Ask everyone: “Where is the First Quarter Moon at sunset?” [At your meridian (at the Zenith)]
43. Tell E.S. to put the First Quarter Moon at his/her meridian.
44. Ask Everyone: “Where is the Sun when the First Quarter Moon is rising?” [At your meridian.]
45. Tell E.S. to put the First Quarter Moon rising in the east.

46. Ask everyone: “Where is the First Quarter Moon at sunrise?” [Along your spinal cord]
47. Tell E.S. to put the First Quarter Moon along his spinal cord.
48. Ask Everyone: “Where is the Sun when the First Quarter Moon is setting in the west?” [Along your spinal cord]
49. Tell E.S. to put the First Quarter Moon setting in the west.

F. Third Quarter Moon

50. Get a new volunteer for the Earth and all the Moon Phases if possible.
51. Tell the Earth Student (E.S.): “Go to 12 o’clock noon”.
52. Ask E.S.: “What Moon phase is setting in your west? [A Third Quarter Moon]
53. Ask Everyone: “Why is the Third Quarter Moon setting in the west at noon?” [The Sun is at a right angle with respect to the Earth and Moon. So, we can only see half the illuminated side of the Moon. The other half of the illuminated side could only be seen if the Earth were on the other side of the Moon.]
54. Ask everyone: “Where is the Third Quarter Moon at sunset?” [Along your spinal cord]
55. Tell E.S. to put the Third Quarter Moon along his/her spinal cord.
56. Ask Everyone: “Where is the Sun when the Third Quarter Moon is rising?” [Along your spinal cord.]
57. Tell E.S. to put the Third Quarter Moon rising in the east.
58. Ask everyone: “Where is the First Quarter Moon at sunrise?” [Along your spinal cord]
59. Tell E.S. to put the Third Quarter Moon along his spinal cord.
60. Ask Everyone: “Where is the Sun when the Third Quarter Moon is setting in the west?” [At your meridian]
61. Tell E.S. to put the First Quarter Moon setting in the west.