

## Lesson 3— Human Simulation Changing Moon

(Taken from Episode 2: 6.1.1 Human Simulation Changing Moon)

<b>Strand 6.1</b> Structure and Motion within the Solar System.	<b>Standard 6.1.1</b> Develop and use a model of the Sun-Earth-Moon system to describe the cyclic patterns of lunar phases, eclipses, of the Sun and Moon, and seasons. Examples of models could be physical, graphical, or conceptual.	<b>Big Idea</b> The moon appears to change shape over time in a cyclical pattern.
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<b>Title:</b> Human Simulation Changing Moon	<b>Time:</b> 50 minutes	<b>CCCs:</b> Patterns Cause and Effect	<b>Practices:</b> Obtain information Develop and use a model Analyzing Data Construct an explanation
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**Phenomenon: The moon's shape changes in a cyclical pattern.**

### Materials

- Journals
- Complete Moon Cycle Chart from last time
- Lunar Cycle Chart from last time
- Flashlights/lamp
- 1.5" Styrofoam balls on a stick
- Eight moon phase cards from the last lesson

### Teacher Directions

#### Starter

1. Start out with a review of what was learned in the last lesson by looking at the models.
2. Watch the video again of what is happening to our view of the moon as the moon orbits the Earth. [https://www.youtube.com/watch?time\\_continue=34&v=NCweccNOaqo](https://www.youtube.com/watch?time_continue=34&v=NCweccNOaqo)
3. Have a discussion to review what they learned.

#### Gathering

##### Ask Questions

1. In the previous episode, students figured out that there is a cyclical pattern.
2. In this episode, students will develop questions with partners or small groups to help them determine the cause of the cyclical pattern that they observed.
3. Students will frame their questions by focusing on the patterns and how the Sun-Earth-Moon system causes the cyclical patterns.
4. Students will share their questions with the class.

**Obtain Information**

1. After the discussion and sharing, have the students bring out their models they made last time and explain what is happening in the Sun, Earth, Moon relationship.

**Reasoning****Develop and Use a Model**

1. Using their observations and questions, students will develop a model of the Sun-Earth-Moon system by creating a physical representation of the system.
2. Their models need to show the cause and effect relationship in the system and be supported by evidence from their observations of the moon's cyclical pattern.
3. After a discussion, give each pair of students a flashlight and a stick with a ball on it.
4. Using their heads as Earth and the flashlight as the sun, have them figure out with the knowledge they know about the moon orbiting the Earth, how the light seems to change as a person is watching from Earth.
  - a. Moon Cycle Simulation Video-  
<https://www.youtube.com/watch?v=wz01pTvuMa0&t=10s>
5. Have the students write in their journals and draw a model of what they saw happening with the model they made.

**Analyzing Data**

1. Have the students go back into their journals to show the cause and effect relationship in the system supported by evidence from their observations of the moon's cyclical pattern.
2. With their findings, the students will analyze the data by looking for reasons through patterns why the moon seems to change and why we see different phases of the moon.

**Communicating****Construct an Explanation**

1. By working in pairs, the students will interpret the information they wrote down to construct an explanation of what cause the light to seem to change in a cyclical pattern.
2. The focus is on to explain why we see different light change in the moon's cyclical pattern of 29 or 30 days.

**Communicating Information**

1. By using the eight phase cards, yellow sun, and green earth, have eight students stand in a circle with the sun on the outside and the earth in the middle, to have them explain why the light changes from phase to phase.

**Assessment**

1. Students' explanations should demonstrate an understanding of the cause and effect of the sun, moon, and earth interact to cause moon phases.

The students do not need to know the names of all the phases of the moon. They will not be assessed on the words. However, they should be able to recognize and name the New Moon, 1<sup>st</sup> Quarter Moon, Full Moon, and Third/Last Quarter Moon and their positions around the Earth for the sake of reference. Students should be able to describe what is going on as the phases change and the shape the moon should be as it orbits the earth.

Student Sheet

Name \_\_\_\_\_

**Understanding the Phases of the Moon**

**Answer these questions**

1. Why does the light on the moon seem to increase on the right side from the New Moon to the Full Moon?

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2. Why does the light on the moon seem to decrease on the left side from the Full Moon to the New Moon?

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3. Why can we see the whole moon lit up during the full moon?

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4. Why can't we see any light on the moon during a new moon?

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5. Why do we only see half the moon lit up on the first and third quarter moon phases?

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6. On the first and third quarter moon phases, why is the light on opposite sides of each other?

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7. Why do we see the same side of the moon during whole lunar cycle?

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8. Why don't we ever see the far side of the moon during the whole lunar cycle?

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9. The Earth does a complete rotation every 24 hours. How long does it take the moon to complete one rotation?

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10. From the answer in question #6, why does it take the moon that long to make a rotation?

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**Understanding the Phases of the Moon**

**Answer these questions.**

1. Why does the light on the moon seem to increase on the right side from the New Moon to the Full Moon?

**As the moon is orbiting to the back of the Earth away from the sun where the earth will be between the moon and sun, we are able to see the light progressively increase on the moon as it is orbiting toward the full moon position.**

2. Why does the light on the moon seem to decrease on the left side from the Full Moon to the New Moon?

**As the moon is orbiting to the front of the Earth toward the sun where the moon will be between the earth and sun, we are able to see the light progressively decrease on the moon as it is orbiting toward the new moon position.**

3. Why can we see the whole moon lit up during the full moon?

**The moon is directly behind the earth in relationship to the sun where the sun, earth, and moon in that order are in a straight line so we can see all the light on the moon.**

4. Why can't we see any light on the moon during a new moon?

**The moon is directly in front of the earth in relationship to the sun where the sun, moon and earth in that order are in a straight line so we see no light at all on the moon.**

5. Why do we only see half the moon lit up on the first and third quarter moon phases?

**The first and third quarter moons are positioned at 90-degree angles from the sun, to the earth, and to either the first or third quarter moon phases. That way we only see half of the light that is on the moon.**

6. On the first and third quarter moon phases, why is the light on opposite sides of each other?

**When the moon is at a 90-degree angle at Earth's left facing the sun, we see the light on the right side of the moon. When the moon is at a 90-degree angle at Earth's right facing the sun, we see the light on the left side of the moon.**

7. Why do we see the same side of the moon during whole lunar cycle?

**The gravitation pull of the earth on the moon is so strong that it keeps the moon from spinning on its own axis, keeping the moon in the position of facing toward the earth the whole time.**

8. Why don't we ever see the far side of the moon during the whole lunar cycle?

**Since the same side of the moon is always facing us because of Earth's gravitational pull on it to keep it in the same position, the moon cannot spin around for us to see the far side.**

9. The Earth does a complete rotation every 24 hours. How long does it take the moon to complete one rotation?

**It takes the moon 29 to 30 days to make a complete rotation.**

10. From the answer in questions #6, why does it take the moon that long to make a rotation?

**The rotation time is the same as its revolution around the sun.**