

**Lesson Title:** The Orbit of the Moon around the Earth **Class Time Required:** 2 hours

**Overview and Purpose:** The purpose of this lesson is to model the orbit of the Moon and Earth around the Sun and to model the phases of the Moon. Students will gain an understanding of these processes. Students will read a book about the phases of the Moon, model the orbit of the Moon and Earth around the Sun, then discuss their observations.

**General Goals:** Students will understand the relationship between the orbit of the Earth and the Moon and the phases of the Moon. Students will read nonfiction text to support the model. Students will learn vocabulary related to the phases of the moon.

**California Content Standards:**

**California State Standards**

**Science**

Students will understand that objects in the sky move in regular and predictable patterns. As a basis for understanding this concept:

- a. Students know the way in which the Moon's appearance changes during the four-week lunar cycle.
- b. Students know that Earth is one of several planets that orbit the Sun and that the Moon orbits Earth.

**Language Arts:**

**Comprehension and Analysis of Grade-Level-Appropriate Text:**

- a. Students will recall major points in the text...
- b. Students will distinguish the main idea and supporting details in expository text.

**Vocabulary and Concept Development:**

- c. Students will use sentence and word context to find the meaning of unknown words.

**Writing**

- d. Students will write descriptions that use concrete sensory details to present and support unified impressions of people, places, things, or experiences.

**Specific Objectives:**

Upon completion of this lesson the participants will be able to:

1. Students will understand the relationship between the Moon phases and the position of the Sun, Earth, and Moon.
2. Students will learn the following vocabulary: new moon, first quarter, full moon, and third quarter.
3. Students will understand the orbit of the Earth around the Sun.
4. Students will understand the orbit of the Moon around the Earth.
5. Students will know the moon does not actually produce light, it only reflects light from the sun.
6. Students will understand the rotation of the Earth.
7. Students will read expository writing.
8. Students will use sentence and word context to find the meaning of unknown words.

**Materials Needed:**

1. The Moon Seems to Change by Franklyn M. Branley - several copies would be helpful for students to explore and use as a reference.
2. Student Worksheet
3. Flashlights - enough for one for each pair of students
4. Moon Models - Styrofoam ball with small stick for handle - enough for one for each pair of students
5. Student Copies of Pretest
6. Student Copies of Posttest
7. Teacher Checklist for each Student

**Activities** (step by step procedure):

1. First, we will read the book The Moon Seems to Change by Franklyn M. Branley. The book gives details about the phases of the Moon and the orbit around the Earth.
2. Second, we will review the orbit of the Earth around the Sun and the rotation of the Earth. Students will model this orbit in partners. One child will be the Sun and the other child will be the Earth. Students will discuss the concept of a day, one rotation of the Earth, and a year, one revolution around the Sun.
3. We will discuss this model. Discussion Questions: How many days does it take for the Earth to make one revolution of the Sun ( $365 \frac{1}{4}$  days). How many times will the Earth rotate as it goes around the sun? ( $365 \frac{1}{4}$  times). What happens with the  $\frac{1}{4}$  day? (Leap Year every 4 years).
4. Next, Earth students will pick up a Moon model (Styrofoam ball with pencil holder) and Sun students will pick up a flashlight. We will model how the Moon orbits the Earth. It takes about 28 days for the Moon to orbit the Earth. This is about one month.
5. We will discuss this model. Discussion question: How many times does the Moon orbit the Earth in one Earth year? (About 12, or 12.3 times) Does the Moon give off its own light? How do you know? (The Moon is represented by a Styrofoam ball and does not give off light.) If the Moon does not give off its own light, why is it so bright in the night sky? (The light from the Sun always lights one half of the moon. Which portion we see depends on the position of the Moon and Earth.)
6. Earth students will pretend their nose is Alamo, California. We will discuss what location on Earth the back of their heads would be (countries in Asia). The Sun students will shine their flashlight and Earth students will show what daytime in Alamo would look like.
7. Earth students will hold up the Moon model. They will turn in place slowly (rotate) and observe how the light portion of the moon changes as they move. They will record their position and the appearance of the moon on a worksheet that will be provided.
8. Earth and Moon students will switch roles. We will repeat steps six and seven.

9. Finally, all students will discuss what they have seen. We will use vocabulary from the book such as: new moon, first quarter, third quarter, full moon, waxing, and waning. Using the worksheet, they will label the different moon drawings.

10. While students are working on their worksheets, I take students aside individually. I act as the sun holding the flashlight as the students model the moon phases. During this time, I assess their understanding by using the checklist. I also ask students questions. For example, I may ask, “Which phase of the moon do you see now?” or “Is the moon waxing or waning?” During this time, I fill out the Student Checklist for each student.

### **Assessment/Evaluation**

A traditional paper and pencil assessment is included in this teacher guide. Two forms have been included - both a pretest and a posttest form. This will allow the teacher to understand the depth of understanding the students gained through this lesson. In addition, students will have an opportunity to respond verbally and in writing to open ended discussion questions either verbally or in written form. Also, the student handout will provide the students' drawings and written observations that the teacher can use to assess their understanding. Finally, I will include a checklist the teacher can use during the student modeling to record the students' comments and answers that show their level of understanding.

### **Teaching Strategies**

1. Create heterogeneous groups. Stronger students can help reteach the concepts to students who struggle.
2. Be sure the room is very dark. Close curtains and turn off lights. This will help the Moon phases appear brighter to the students.
3. Use opaque Styrofoam balls. If light can travel through the Styrofoam balls, the Moon phases will not appear.

### **Adaptations/Extensions**

1. Crosscurricular – Students can discover and read fables created to explain the phases of the Moon. They can write a fable of their own to describe the phases of the Moon.
2. Learning Disabilities – Students with learning disabilities can either draw pictures or verbally describe their understanding of the phases of the Moon. Have students make observations of the Moon for a few weeks before this lesson in order to build background knowledge.
3. Gifted – Gifted students can research the process of studying things that are a great distance from the Earth. This can include a history of the study of astronomy.

## Thought provoking questions

These questions can be used for group discussion or for written answers in the students' learning logs.

1. How many days does it take for the Earth to make one revolution of the Sun?

*Answer: The Earth takes  $365 \frac{1}{4}$  days to revolve around the Sun. This is known as one Earth year. Each planet takes a different amount of time to rotate around the Sun.*

2. How many times will the Earth rotate as it goes around the sun once?

*Answer: The Earth rotates  $365 \frac{1}{4}$  times as it revolves around the Sun. This is also the number of days in one Earth year.*

3. If it takes  $365 \frac{1}{4}$  days for the Earth to go around the Sun, but each year only has 365 days, what happens to the  $\frac{1}{4}$  day?

*Answer: Leap Year occurs every 4 years. This is because each 4 times around the Sun, there is a total of one extra day. ( $\frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} = 1$ ) This day is added on February 29<sup>th</sup> every fourth year, making that year 366 days long.*

4. How many times does the Moon orbit the Earth in one Earth year?

*Answer: About 12, or 12.3 times. This is why we have about twelve full moons each year.*

5. Does the Moon give off its own light? How do you know?

*Answer: No, in this model, the Moon is represented by a Styrofoam ball and does not give off light.*

6. If the Moon does not give off its own light, why is it so bright in the night sky?

*Answer: The Moon reflects light from the Sun. In this model, this is represented by the Styrofoam ball (the Moon) reflecting light from the flashlight (the Sun).*

## Resources and References

Websites

<http://www.solarviews.com/eng/moon.htm> - This website provides an introduction and statistics about the moon. It also contains pictures, video, and animations of the moon, including an animation of the lunar phases.

<http://www.fys.ruu.nl/~zagers/maan.html> - This website contains information on features of the moon you can see with the naked eye, with binoculars, and with telescopes.

<http://www.fourmilab.ch/earthview/vplanet.html> - Views of a map of the earth or moon showing the day and night regions can be seen on this website.

[http://aa.usno.navy.mil/data/docs/RS\\_OneYear.html](http://aa.usno.navy.mil/data/docs/RS_OneYear.html) - On this website, students can see the times the Sun and Moon rise and set for individual cities across the United States.

<http://www.obliquity.com/astro/bluemoon.html> - What is a blue moon? How often does it really happen? These questions and more are answered on this website.

**Author page**

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