

1. Essential Element

Activity/Lesson Title: Earth-Sun-Moon Relationships

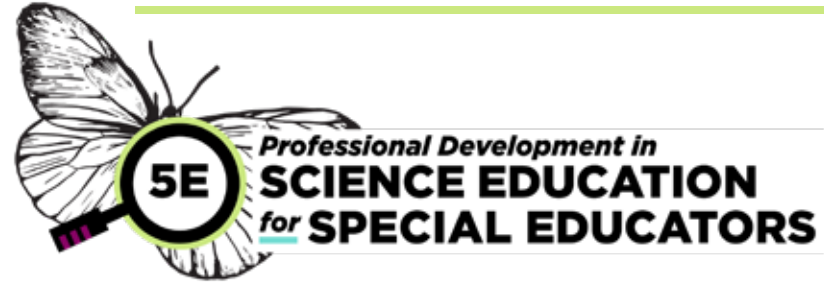
EE.MS.ESS1-1: Develop and use a model of the Earth-Sun-Moon system to describe the cyclic patterns of lunar phases, eclipses of the Sun and Moon, and seasons.

Teacher: Madilyn

Grade Level: Middle School (6-8)

Student: Jeremiah

Level: Target



2. Science and Engineering Practice

SEP 2: Developing and Using Models

SEP description: Supports students as they use a model to describe phenomena.

3. Disciplinary Core Idea

The Universe and Its Stars

Core Idea description: Patterns of the apparent motion of the Sun, the Moon, and stars in the sky can be observed, described, predicted, and explained with models.

4. Crosscutting Concept

Patterns

Concept Description: Patterns can be used to identify cause and effect relationships.

5. Linkage Level Descriptors

Initial: Recognize models of the Earth, Moon, and Sun system.

Precursor: Use a model to show that Earth's Moon moves around Earth, and Earth and its Moon move around the Sun.

Target: Use an Earth-Sun-Moon model to show that Earth's orbit around the Sun corresponds to a calendar year and the orbit of the Moon around Earth corresponds to a month.

6. Student's Typical Accessibility Supports

- Computer Simulations
- Physical Models
- Use of glossaries or word walls for vocabulary support
- Text to speech and speech to text extensions

7. Student Prior Experiences, Prior Knowledge

- The student likes telescopes.
- The student likes computer games.
- The student likes going sledding in winter.
- The student has prior knowledge of how the Moon orbits the Earth and how the Earth and Moon orbit the Sun.
- The student has prior knowledge of simple models.

8. Phenomenon to Explore

Question: How long does it take the Moon to make one full orbit around the Earth? How long does it take the Earth to make one full orbit around the Sun?

9. Possible Alternative Conceptions

Some students may think (incorrectly) that

- The solar system is geocentric (i.e., the Earth is at the center and other bodies, like the Sun, orbit around it).
- The Earth, Sun, and Moon are approximately the same size.
- Rotation and revolution are the same thing.
- The Earth and Moon are both orbiting the Sun without the Moon orbiting Earth.
- The Moon is only visible at night.

10. UDL Options and Solutions to Potential Barriers

- Increase or reduce the complexity of models used
- Have students use a checklist to chart Moon cycles for three months
- Use a variety of formats (e.g., videos, photographs, diagrams, computer simulations).
- Use a variety of materials (e.g., models, common items such as Styrofoam balls; felt board materials).
- Use manipulatives to build models that represent the Earth and Moon orbits..

11. Engage

Think

- How can I make sure to access students' prior learning?
- How can I use the CCC to connect everyday language with the scientific language of the phenomenon?
- How can I support student participation by scaffolding the SEP?

Teacher Will

- Do a shared reading with students using an appropriately leveled book titled "*The Sun, Earth, and Moon*".
- Ask students to think about patterns in how the Moon moves around the Earth and in how the Earth revolves around the Sun.

Students Will

- Participate in a shared reading session.
- Generate ideas to respond to questions about relationships between the Earth, Sun, and Moon.

12. Explore

Think

- What is difficult or inaccessible about the phenomenon, and how can I make it more accessible in the Explore phase?
- How can students collect data in a way that helps answer a scientific question?
- How can I encourage students' careful observation and asking good questions vs. looking for only the "right answer"?

Teacher Will

- Share an online simulator that models how the Earth, Moon, and Sun revolve around each other.
- Assist students in using a graphic organizer to track data (using the simulator) about how long it takes for the Moon to revolve around the Earth and how long it takes for the Earth to revolve around the Sun; track data over several months and look at historical data to compare years

Students Will

- Use the online simulation to record data about the position of the Moon in relation to the Earth and how the Earth orbits the Sun.
- Play the simulation and record data in the table about how the Earth, Sun, and Moon move together.

13. Explain

Think

- How can I help students connect science topics, phenomena, data, and everyday experiences? How can I help my students differentiate everyday language from scientific language? What reasoning helps students see or explain the invisible?

Teacher will

- Assist students in reviewing the data collected.
- Ask prompting, open-ended questions to help students make connections between the data and the question that they are trying to answer (e.g., How do the Earth, Moon, and Sun move around each other?).
- Assist students in completing a CER organizer.
- Ask questions about the patterns students see as they look at data over time.

Students Will

- Complete a CER statement

Claim: The Moon moves around the Earth, and the Earth moves around the sun, in a regular and repeating pattern.

Evidence:

- » I looked at data in my data table that showed the Moon making a full circle around the Earth every 28 days and the Earth moving around the Sun every 365 days.
- » I read in a book that the Moon revolving around Earth is how we came up with months in a year.

Reasoning: The Moon moves around the Earth and the Earth moves around the Sun in a pattern that repeats.

14. Elaborate

Think

- How can I help enrich or extend student ideas? Are there related science concepts that would support and extend student learning?

Teacher Will

- Assist students in using PhET computer simulations.
- Assist students in picking a different planet that has a moon (pick one moon if that planet has more than one); compare the time of orbit for that moon to our moon. Is there a pattern of data for how long that moon travels for three months compared to our moon?

Students Will

- Ask questions using PHET computer simulations.
- Respond to questions about different kinds of Earth/Moon/Sun models.

15. Evaluate

Think

- What do I need to see or hear from my students that assures that they have learned the science content? What information must I gather to inform my teaching as I move through the lesson?

Teacher Will

- Provide an exit ticket at the end of the lesson asking about the phenomenon and about what happened during the investigation.
- Use the student responses to inform the evaluation.

Students Will

- Complete the exit ticket.
- Respond to questions posed by the teacher summarizing the investigation, what they did, and what they learned from it.
- Make a graph of the new moon they chose and compare that graph to data for Earth's moon.