

Earth's Place in the Universe Lesson 1: *The Solve*

Educator's Resource Guide

Objective

In *The Solve*, students will:

1. Solve a mystery to find out why Colorado and New Zealand have different weather on the same day.
2. Create a Mind Map to explore relationships among complex Sun-Earth System vocabulary.
3. Communicate understanding that seasons differ across the globe because of the tilt of the earth and thus the angle at which the sun hits the earth at given times.

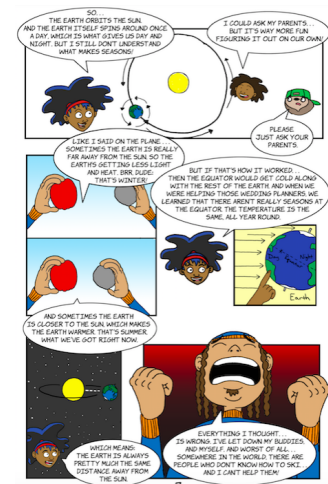
Time Required: 40-75 minutes

Materials Required	Safety Considerations	Science & Engineering Practices
<ul style="list-style-type: none"> ● Student Guide (<i>includes student agenda and Mind Map</i>) ● Sun-Earth System Comic Mystery ● Scissors ● Glue or tape 	None	<ul style="list-style-type: none"> ● Developing and using models ● Constructing explanations or arguments from evidence

Sun-Earth Comic Mystery Description

When Neve and his ski instructor friends step off the plane in New Zealand, they're expecting a snowy landscape. Instead, they find themselves surrounded by people in bikinis enjoying the summer sun. Neve and his jobless friends begin to panic!

They call Mosa Mack to help them figure out how it could possibly be summer in New Zealand when it was just winter in Colorado. Mosa and her team soon find that the answer is not as simple as it seems and they must prove a series of guesses wrong before they get to the right theory.



Inquiry Scale: Leveling Information

The Solve can be completed in various settings, including presentation-style, small groups, or individually. In the case of a flipped or blended classroom, it can be completed entirely at home.

Level 1: Most teacher-driven (*recommended for grades 4–5*)

View the animated mystery twice: once in full, and a second time along with the discussion questions, pausing the video as needed to answer the episode questions as a group. Project and complete the Mind Map as a class-wide activity. This can be done digitally or on paper. Have students informally quiz each other on the vocabulary until you feel they're familiar with the terms. Use the discussion questions at the bottom of the Mind Map to have a group discussion. Finally, have students complete the quiz digitally or on paper as an exit ticket.

Level 2 (*recommended for grades 5–6*)

View the animated mystery in full. Afterwards, have students work through the episode questions to the best of their ability in small groups. Play the mystery a second time, pausing the video to discuss each question. Direct students to complete the Mind Map in small groups, either digitally or on paper. Come back as a class to review correct answers, as needed. Have students informally quiz each other on the vocabulary until you feel they're familiar with the terms. Use the discussion questions at the bottom of the Mind Map to have a group discussion. Finally, have students complete the quiz digitally or on paper as an exit ticket.

Level 3 (*recommended for grades 6–7*)

Provide students with their student URL and have students view the animated mystery in small groups. Have students play the animated mystery once in full and then answer episode questions in their table groups to the best of their ability. Then, as a class, project the mystery, pausing, as needed, to discuss episode questions in a think-pair-share format. Have students complete the Mind Map in table groups, either digitally or on paper. Have students quiz each other on the vocabulary until you feel they're familiar with the terms. In table groups, have students go through the discussion questions on their own, and review answers as a class. Finally, have students complete the quiz digitally or on paper as an exit ticket.

Level 4 (*recommended for grades 7–8*)

Provide students with their student URL and have students view the animated mystery and complete episode questions in pairs. Have students review their answers with a neighboring table group. Have students complete the Mind Map in pairs, either digitally or on paper. Have students quiz each other on the vocabulary until they feel they're familiar with the terms. Have these same pairs go through the discussion questions. Finally, have students complete the quiz digitally or on paper as an exit ticket.

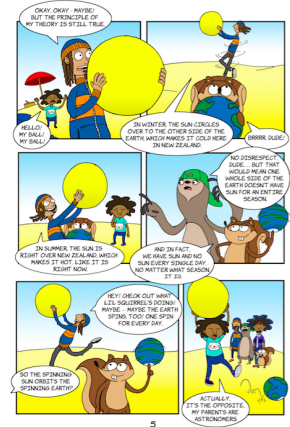
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Agenda

I. Solve the Sun-Earth System Mosa Mack Mystery (20 minutes)

Differentiation Tip: The comic book and motion comic video can be read/watched as a class, in small groups, individually, or completed for homework. For additional support, students can read or watch the comic/episode twice: once before completing the questions, and once with teacher guidance, pausing to discuss each answer.

1. Read/watch the Mosa Mack Mystery on the Sun-Earth System.
2. Students answer the questions in their Student Guide as they read/watch. Encourage students to cite the specific page numbers/time codes in the Comic Mystery to promote writing with supporting evidence. Answers can be found in the key below.



II. Vocabulary Mind Map Activity (15–45 minutes)

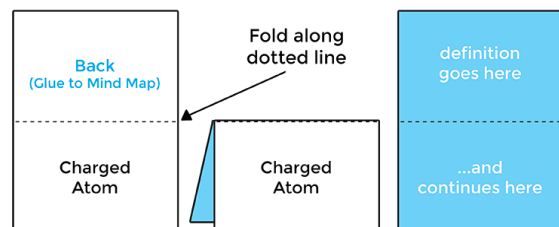
Differentiation Tip: The Mind Map can be done as a class, in small groups, individually, or completed for homework.

1. Students may complete the Mind Map **digitally**. Follow the directions below. (15 minutes)

- a. Go to <https://mosamack.com/home/earth-place-in-the-universe>
- b. Select **Lesson 1: The Solve**.
- c. Select **Vocabulary** and complete **Part 1**: matching terms with definitions.
- d. Complete **Part 2**: matching terms and definitions with images on a diagram.

2. To complete the Mind Map **on paper**, follow the directions below (45 minutes).

- a. Print and pass out the Student Guide: Sun-Earth System Lesson 1: *The Solve*.
- b. Introduce the warm up task: students will be making a Mind Map of the vocabulary for this Sun-Earth System unit.
- c. Model the directions carefully, emphasizing the following. Students should:
 - **cut** out the vocabulary cards on the solid lines only
 - **fold** the cards at the dotted lines
 - write the definition of the term on the inside of the card using definitions provided



- d. Students use the clues from the Mind Map images, definitions, and terms to place the cards in the correct location in the Mind Map.
- e. Check that the students have matched their cards correctly before moving on.
- f. Students use glue or double-sided tape to connect the back of the vocabulary card to the correct place on the Mind Map.
- g. Students discuss the questions with their group or as a class when they have completed the Mind Map.

Teacher Tips:

- Since this is the first time many of the students will have seen these vocabulary terms, have students work together to use the images, definitions, and collaborative thinking to figure out where the terms go.
- Check in on student groups through this process. When you see a student or group who has placed a card in the correct place, ask a facilitating question such as, “Why do you think that term goes there?” or “What evidence leads you to believe that term goes there?” When students explain their thinking, this is a great opportunity to provide positive reinforcement. Then, encourage students to share their reasoning to the class or to other groups who may have trouble identifying the location of that specific term.
- If you do not have access to a color printer, provide students with black and white copies and project the colored version of the Mind Map at the front of the room so that students can reference both images.

III. Exit Ticket: Check for Understanding (10–15 minutes)

Differentiation Tip: This can be done in groups, pairs, individually, or more formally as a quiz online.

1. Students complete the exit ticket to check for understanding. This can be done online by selecting the **Quiz** button in Lesson 1 or on paper in the Student Guide. Answers are in the key below.

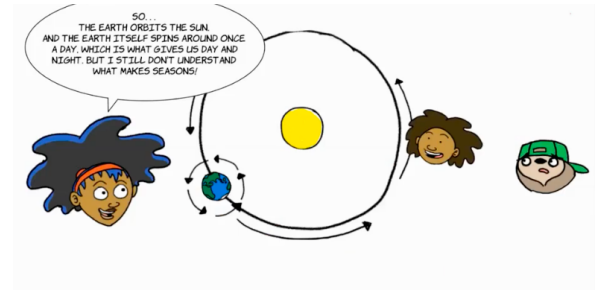
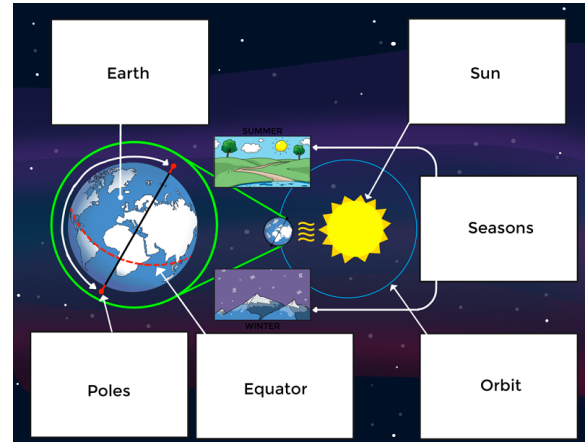
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Answer Key

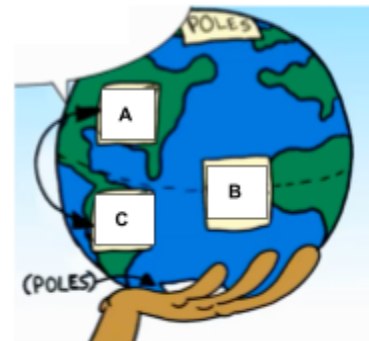
Mind Map

Mystery Questions

1. What problem did Neve and his friends discover on the plane to New Zealand? (0:34 - 0:41) *On the plane, Neve and his friends observed other passengers in summer clothing. They were the only people in winter clothing with ski gear.*
2. What season is it when Neve arrives in New Zealand? (2:00) *It is the summer season when Neve arrives in New Zealand.*
3. Neve believes that the Sun circles around the Earth, making it colder or warmer. Why is he wrong? (3:45-4:30) *Neve is wrong because the opposite is true; the Earth orbits around the Sun.*
4. Which is larger, the Earth or the Sun? Explain. (4:30 - 4:50) *The Sun is much larger than the Earth. When looking at the scale of the Earth and the Sun, 1,300,000 Earths can fit into one Sun.*
5. Finish Mosa's following statement: The Earth orbits the Sun. (5:22-5:30)
6. Finish Mosa's following statement: The Earth spins around once a day which gives us day and night. (5:22-5:30)
7. Look at the Earth Diagram shown in the comic. What part of Earth is shown by each letter? (6:57-7:10)



Letter	Part of Earth
A	<i>Northern Hemisphere</i>
B	<i>Equator</i>
C	<i>Southern Hemisphere</i>



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8. Why is it warmer at the equator and colder at the poles? (7:00-7:28) *At the equator, the sun is hitting the earth straight-on, while at the poles, it is hitting at an angle.*
 9. When it is winter in the Northern Hemisphere, what season is it in the Southern Hemisphere? (7:35-7:40) *When it is winter in the Northern Hemisphere, it is summer in the Southern Hemisphere as this hemisphere is tilted towards the sun receiving more direct sunlight.*
 10. What did Mosa figure out? Why do we have seasons? *The earth is tilted on its axis, which causes one of the hemispheres to be more exposed to direct sunlight than the other hemisphere at different times of the year. This causes these regions to be heated differently and causes seasons! Thus, if they are looking for winter, they should head back to the Northern Hemisphere.*
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Quiz:

1. As the Earth orbits around the Sun it:
 - a. Stays in one position
 - b. Rotates (spins) once a day**
2. True or False: The Earth rotates (spins) once a day, causing day and night.
 - a. True**
 - b. False
3. True or False: The Earth is bigger than the Sun.
 - a. True
 - b. False**
4. In the summer there are ____ hours of daylight at the North and South Pole. In the winter, there are ____ hours of daylight at the North and South Pole.
 - a. More, fewer**
 - b. Fewer, more
 - c. Daylight hours are always the same at the North and South poles.
5. All of the following statements are true about the Earth, except:
 - a. The Earth is round
 - b. The Earth rotates (spins) on its axis
 - c. The Earth orbits around the Sun
 - d. The seasons are always the same in the Northern and Southern hemispheres on Earth.**

6. Which of the following is true about the equator?
 - a. It is always winter at the equator and there is a lot of snow.
 - b. The sun hits the equator at an angle, making it cold.
 - c. **The sun hits the equator head on, making it warm.**
 - d. None of the above

7. The tilt of the Earth in its orbit around the Sun causes different _____ in the Northern and Southern hemispheres.
 - a. Spinning
 - b. **Seasons**
 - c. Speed
 - d. Color