

## Introduction:

The Teacher Guide is designed to support teachers in teaching with the new Mystery Science Anchor Layer. This is a new feature, and we plan to revise and improve the Anchor Layer based on your feedback! Thank you!

## What is the Anchor Layer?

In NGSS instruction, there is a distinction between *anchor* phenomena and *investigative* phenomena. Anchor phenomena are complex phenomena that students need an entire unit, and multiple scientific ideas, to explain.

Investigative phenomena are specific, lesson-level phenomena that help students understand smaller conceptual pieces of a larger idea. As students investigate specific phenomena, they can use those learnings to make sense of the anchor phenomenon that guides the unit.

We think of our traditional lessons as investigative phenomena. This new Anchor Layer adds an anchor phenomenon to open and frame the unit. After each lesson, students return to the anchor phenomenon and apply what they've learned to develop increasingly sophisticated models, arguments, explanations or design solutions that help them make sense of the anchor phenomenon.

We've designed the Anchor Layer to be optional for teachers. Teachers can teach our lessons with or without the Anchor Layer.

## Storylines:

Storylines provide a coherent overview of how the Anchor Layer unfolds, what students are figuring out at each step, and questions that lead to the next investigation. [View Anchor Layer Storylines](#)

## Before Lessons

### I. Anchor Phenomenon

Observe puzzling, complex real-world events explained through scientific evidence

### II. Student Inquiry

Make observations and ask questions

### III. Initial Student Ideas

Develop initial Conceptual Model, Argument, Explanation, or Design Solution

## During Lessons

### IV. Investigative Phenomena

Investigate specific real-world events that provide conceptual pieces to a larger idea

### V. Student Revision

Revise Conceptual Model, Argument, Explanation, or Design Solution

## After Lessons

### VI. Performance Task

Demonstrate conceptual understanding in a new scenario

## TEACHER RESOURCE

### Unit Overview

#### Key Concepts Overview:

- The objects we can see in the sky change over the course of each day and night.
- The Moon appears to change shape in a cycle that repeats approximately once per month.
- Some objects can only be seen during the day. Some objects can only be seen at night. Some objects can be seen both during the day and the night.

3-Dimensional Alignment	
Crosscutting Concepts	Patterns
Science and Engineering Practices	Analyzing and Interpreting Data
Disciplinary Core Ideas	ESS1.A: The Universe and its Stars
Performance Expectations	1-ESS1-1. Use observations of the sun, moon, and stars to describe patterns that can be predicted.

Unit Pacing Guide			
Anchor Phenomenon	1 hour	Lesson 3	1.5 hours
Lesson 1	1.5 hours	Performance Task	1 hour
Lesson 2	1.5 hours		

Note: Using Optional Extensions for Lessons 1-3 can extend each lesson up to an additional 2 hours.

## TEACHER RESOURCE

### Unit Overview

## Why does the Moon look blue in some photos?



The Moon is something that many, many people associate with the night sky. The association between the Moon and nighttime is so strong that the shape of the Moon is frequently used to represent nighttime itself.

However, you are almost equally likely to see the Moon during the day as you are to see it at night. In fact, the Moon is visible during the day on *most* days. And yet it is a well-documented misconception among elementary-age students that the Moon is only visible at night.

The Moon is easily visible during both the day and the night because it is both very large and very bright. The Sun is so bright that it outshines most of the other stars. This is why the stars are not easily visible during the day. The Moon is bright enough that we can continue to see it when the Sun rises.

There are other objects in space that can be seen during the day, such as the planets Venus and Jupiter. They are much, much harder to spot, though, because they are much smaller and much dimmer.

## BEFORE LESSON 1

### Anchor Phenomenon

#### I. Anchor Phenomenon

Puzzling, complex real-world events explained through scientific evidence

1. Prepare your classroom for the Anchor Phenomenon lesson:
  - a. Create a class See-Think-Wonder chart
2. Begin the Anchor Phenomenon lesson. The lesson includes visuals and text, and it presents the students with an introduction to one aspect of the mystery they will be solving: why does the Moon look gray and white in most pictures, but blue and white in others?

**Tip:** The unit anchor phenomenon is a real-world occurrence that motivates students to ask questions and learn more about scientific concepts. Encourage them to investigate throughout the unit.



#### II. Student Inquiry

Students make observations and ask questions

1. Guide students through the first of the See-Think-Wonder slides.
2. Discuss class responses and write them in the first column of your class See-Think-Wonder chart.
3. Repeat for the second (*I think...*) and third (*I wonder...*) slides.

**Tip:** The chart on the next page provides possible student responses. Use this resource to help you further the See-Think-Wonder discussion with your students.

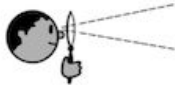


## BEFORE LESSON 1

Anchor Phenomenon

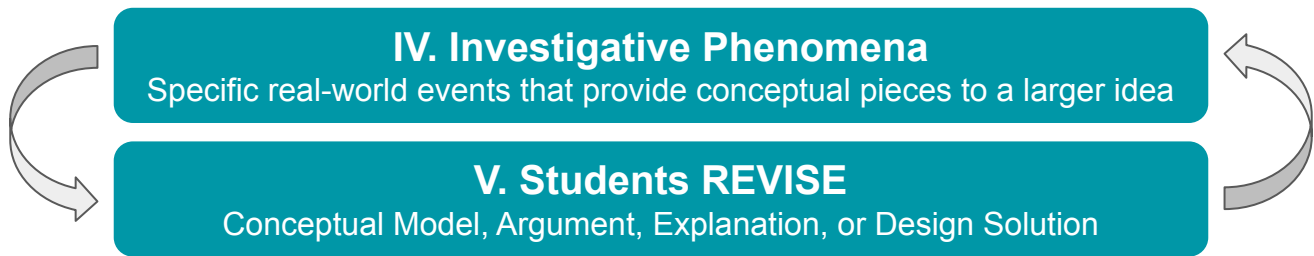
### II. Student Inquiry (continued) Students make observations and ask questions

Sample student See-Think-Wonder responses

### See-Think-Wonder Chart

<p><b>See</b> What did you observe?</p> 	<p><b>Think</b> How can you explain what is happening?</p> 	<p><b>Wonder</b> What questions do you have?</p> 
<ul style="list-style-type: none"> <li>• <i>The Moon looks gray and white in most pictures</i></li> <li>• <i>The Moon looks blue and white in one picture</i></li> <li>• <i>The sky around the Moon is either blue or black</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>The camera made the Moon blue</i></li> <li>• <i>The Moon is out during the day</i></li> <li>• <i>Somebody must have colored the picture</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Why is the Moon different colors?</i></li> <li>• <i>When do you see the Moon?</i></li> <li>• <i>Does the Moon change colors?</i></li> </ul>

## DURING LESSONS



1. Teach the lesson (Investigative Phenomenon).
2. **Anchor Connection (after Activity):**
  - a. After the Activity of each lesson, continue advancing through the slides to the Anchor Connection.
  - b. Discuss the **Anchor Connection** questions.
  - c. You will update the See-Think-Wonder chart after each lesson. Students will add new things that they think will explain the phenomenon, answer any previously recorded questions, and record new questions that arise.

Lesson ( <i>Investigative Phenomenon</i> )	During the Anchor Phenomenon Connection slides, guide students toward these ideas:	Students will:
<p><b>Lesson 1:</b> When can you see the full moon? (1-ESS1-1)</p>	<p>We can look at pictures of the Moon to determine the phase of the Moon. We can also determine if the pictures were taken during the day or the night. The sky is black during the night, and blue during the day. So, the pictures tell us <i>both</i> the phase <i>and</i> whether the picture was taken during the day or night.</p>	<ul style="list-style-type: none"> <li>revisit the See-Think-Wonder chart that they initially worked on during the Anchor Phenomenon, and add that the Moon looks blue because the picture was taken during the day.</li> </ul>
<p><b>Lesson 2:</b> Why do the stars come out at night? (1-ESS1-1)</p>	<p>In the previous lesson, students learned that we can see the Moon during the day. In this lesson, students learn why the stars cannot be seen during the day, and apply this to explain <i>why</i> we can see the Moon during the day. The Moon is very bright, and that is why it can be seen during the day, while the stars cannot.</p>	<ul style="list-style-type: none"> <li>revisit the See-Think-Wonder chart that they initially worked on during the Anchor Phenomenon, and add that the Moon is visible during the day because it is so much brighter than the stars.</li> </ul>

**DURING LESSONS**

*Continued from page 7*

Lesson (Investigative Phenomenon)	During the Anchor Phenomenon Connection slides, guide students toward these ideas:	Students will:
<p>Lesson 3: How can the stars help you if you're lost? (1-ESS1-1)</p>	<p>This anchor connection serves as a review of what students have learned in the unit. First, the Moon is visible during the day. Second, the Moon is visible during the day because it is very bright, unlike the stars.</p>	<ul style="list-style-type: none"> <li>• discuss and review some of the content from earlier in the unit.</li> </ul>



## AFTER LESSONS

### Performance Task Lesson

#### VI. Performance Task

Students demonstrate conceptual understanding

The performance task is an opportunity for students to apply their conceptual understanding to a new scenario.

#### **Crosscutting Concepts: Patterns**

This is a great opportunity to reinforce the crosscutting concept of **patterns**.

- The Moon follows several repeating cycles. One cycle repeats approximately each month, and involves the apparent shape of the Moon changing. The apparent change in shape is caused by a change in which portion of the Moon is illuminated by the Sun over time. A second, concurrent cycle has to do with when the Moon is visible in sky. In this cycle, the Moon might be visible only during the night, during both the day and the night, or not visible during either. By identifying **patterns** in these cycles, we can predict the apparent shape of the Moon and when it will be visible in the sky.

[Matrix of Crosscutting Concepts in NGSS](#)

1. Prepare in advance
  - a. Students can work individually, in pairs, or you may choose to work with small groups.
  - b. Print as many copies of the What can I see in the sky? worksheet as you will need for your students. One copy will be needed for each individual, each pair, or each small group.
2. Begin the Unit Review, which includes key concepts from the lessons in the unit and the Anchor Layer itself.
3. Begin the Activity. The activity includes a step-by-step guide and discussion questions throughout.