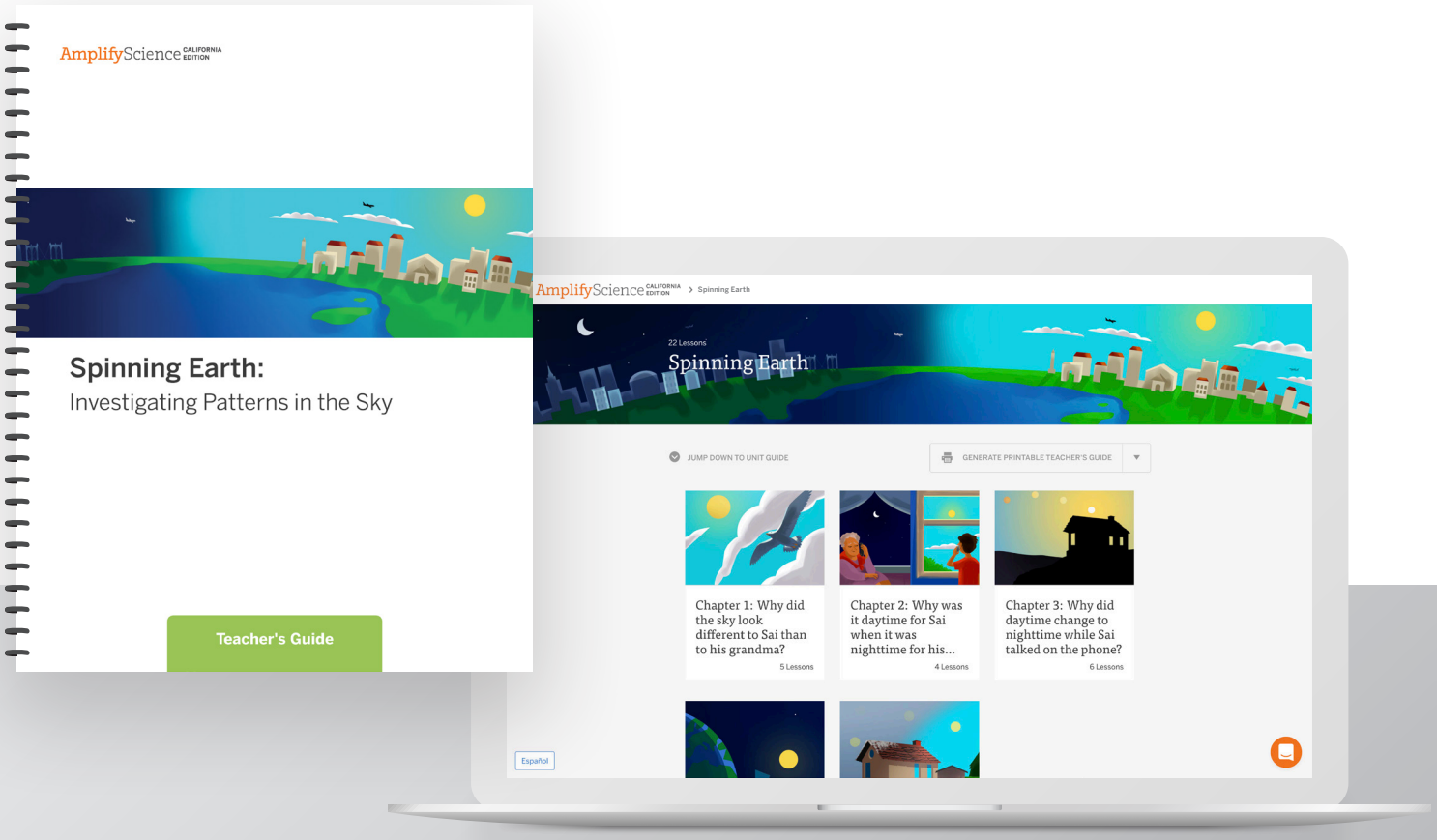
Amplify Science
CALIFORNIA

Grade 1

UNIT GUIDE

Spinning Earth



Amplify.

THE LAWRENCE HALL OF SCIENCE
UNIVERSITY OF CALIFORNIA, BERKELEY

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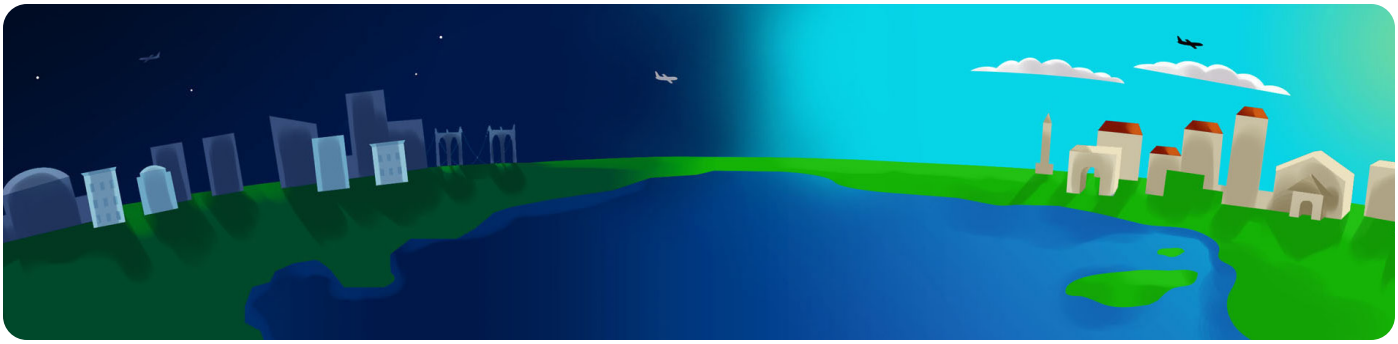


Welcome to Spinning Earth

In an effort to make sense of their own daily experience, many young children have constructed their own conceptions about the shape of Earth and its motion. Some think Earth is round like a plate and that the sun revolves around the edge of the plate, or that the Earth is spherical but we live on a flat part on top. Others accept the fact that Earth is round like a ball, but don't understand how this fundamentally determines a wide variety of phenomena. That's why Amplify Science California gives young students opportunities to deeply investigate the connection between these ideas, everyday phenomena, and how the workings of the universe affect how we live our lives.

> Unlike a typical curriculum, Amplify Science California anchors learning by inviting students to take on the role of scientists and engineers.

In this unit, students take on the role of sky scientists. Their job is to help a boy named Sai figure out why he and his grandma see different things in the sky when they talk on the phone. Working together, students figure out why the sun makes a pattern in the sky throughout the daytime, why we experience repeating cycles of daytime and nighttime, and furthermore how these patterns are affected by the seasons.

Unit Type: Investigation

Student Role: Sky Scientists

Phenomenon: The sky looks different to Sai and his grandma when they talk on the phone.

Core Concept: Understanding why we observe daily cycles of day (when we see the sun in an arcing path across the sky) and night (when we see stars but not the sun)

Target Performance Expectations:

- 1-ESS1-1: Observable Patterns of Sky Objects
- ESS1-2: Amount of Daylight

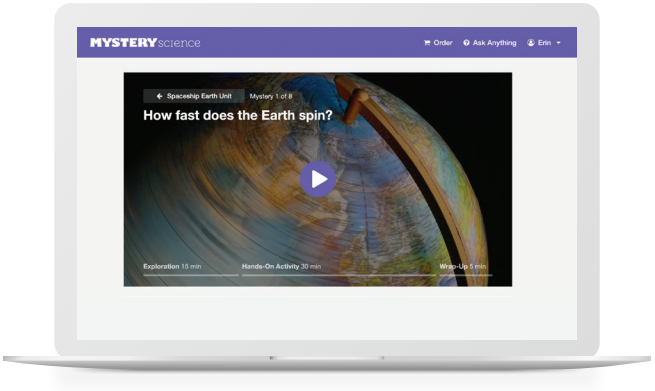
Students figure out the unit phenomenon through the use of a variety of resources.

Big Books

Student Books

Hands-On Kit

Videos



About technology in this unit:
Amplify Science California gives you the flexibility to use technology in the way that meets your needs best. In K–2, teachers have the option of using:

- **Student digital licenses** that allow for online completion of work, teacher feedback and grading, and digital class management.
- **Traditional consumable resources** that allow for a more familiar paper and pencil experience.

Whether students use the student digital experience or print workbooks, there are some technology-based activities all students will experience from time to time. In grade 1, these activities are limited to digital readers and other media (i.e., videos, images).

About reading in this unit:
In grade 1, students are never asked to read alone. Rather, books are read *to, with,* and *by* students with ample scaffolding and support provided by the teacher. Big books are used to introduce ideas through read-aloud and shared reading experiences. Matching student books allow for small-group reading and reading in pairs.

Chapter 1: The storyline begins

What students investigate:

Why did the sky look different to Sai than to his grandma?

What they figure out:

Sai and his grandma saw different things at the same time because they live in different places. When it is daytime for Sai, it is nighttime for his grandma. When Sai sees the sun, Sai's grandma sees the stars.

How they figure it out:

- Observing the daytime sky
- Considering what can be seen in the night sky once the sun goes down during a read aloud of the big book *After Sunset*
- Comparing and contrasting what people in different places on Earth see in the sky at the same time using evidence from live webcams
- Noticing patterns in what they see in the sky

KEY

 HANDS-ON

 READING

 STUDENT-TO-STUDENT DISCUSSION

 TEACHER

 TEACHER-LED DISCUSSION

 WRITING

DAY 1 | LESSON 1.1

Pre-Unit Assessment

- Leading a Pre-Unit-Assessment Conversation (10 min)
- Introducing Sai and His Grandma (5 min)
- Making Sky Observations (20 min)
- Discussing Sky Observations (10 min)

Pre-Unit Assessment

DAY 2 | LESSON 1.2

After Sunset

- Revisiting Sai and His Grandma (5 min)
- Making New Sky Observations (15 min)
- Reflecting on Sky Observations (5 min)
- Reading *After Sunset* (15 min)
- Discussing Additional Sky Observations (5 min)

On-the-Fly Assessment

DAY 3 | LESSON 1.3

The Pattern of Daytime and Nighttime

- Organizing Daytime and Nighttime Data (20 min)
- Sky Investigations Role-Play (5 min)
- Reading About Patterns (10 min)
- Reflecting on Daytime and Nighttime Patterns (10 min)

On-the-Fly Assessment

DAY 4 | LESSON 1.4

The Sky from Different Place

- Observing the Sky from Different Places (20 min)
- Sky Investigations Role-Play (5 min)
- Discussing Daytime and Nighttime (10 min)
- Organizing Webcam Data (10 min)

On-the-Fly Assessment

DAY 5 | LESSON 1.5

Explaining the Sky in Different Places

- Discussing the Sky in Different Places (10 min)
- Reflecting on Daytime and Nighttime (15 min)
- Writing to Sai (15 min)
- Reflecting on Our Work as Scientists (5 min)

Critical Juncture Assessment
Self-Assessment

Chapter 2: The storyline builds

What students investigate:

Why was it daytime for Sai when it was nighttime for his grandma?

What they figure out:

It was daytime for Sai when it was nighttime for his grandma because Earth is shaped like a ball, and Sai and his grandma live on different parts of Earth. When the place where Sai lives is facing the sun, the place where his grandma lives is facing away from the sun.

How they figure it out:

- Watching videos of Earth to develop an understanding that Earth's shape is round like a ball
- Observing how different parts of Earth face the sun at different times using globes and their own heads as models of Earth
- Learning about the work of three scientists and engineers who explore space, both from Earth and by flying in spacecraft, during a shared reading of the big book *Space Explorers*

KEY


HANDS-ON


READING


STUDENT-TO-STUDENT DISCUSSION


TEACHER


TEACHER-LED DISCUSSION


WRITING

DAY 6 | LESSON 2.1

Observing Earth from Space

- Returning to Sai and His Grandma (5 min)
- Observing Earth from Space in *After Sunset* (10 min)
- Zoom Out to Space (10 min)
- Reorganizing Webcam Data (20 min)
- Reading *Space Explorers* (15 min)

On-the-Fly Assessment

DAY 7 | LESSON 2.2

Daytime and Nighttime in Places on Earth

- Patterns on the Globe (10 min)
- Introducing Mount Nose (10 min)
- Positioning Globes (5 min)
- Making Predictions About Daytime and Nighttime (15 min)

On-the-Fly Assessment

DAY 8 | LESSON 2.3

Explaining Daytime and Nighttime

- What We Know About Daytime and Nighttime (10 min)
- Revisiting Mount Nose (10 min)
- Explaining Daytime and Nighttime on Earth (15 min)
- Diagramming Daytime and Nighttime on Earth (15 min)

On-the-Fly Assessment

DAY 9 | LESSON 2.4

Explaining Sai's Problem

- Where Sai and His Grandma Were (10 min)
- Placing Sai and His Grandma on the Globe (15 min)
- Writing About Daytime and Nighttime (15 min)
- Reflecting on Our Work as Scientists (5 min)

Critical Juncture Assessment
Self-Assessment

Chapter 3:
The storyline goes deeper

What students investigate:

Why did daytime change to nighttime while Sai talked on the phone?

What they figure out:

It changed from daytime to nighttime because Earth is spinning. When Sai and his grandma started talking, he saw the sun because the place on Earth where he lives was facing the sun. As Earth spins, the place where Sai lives moves to face away from the sun, so it changes to nighttime.

How they figure it out:

- Observing the position of the sun through the course of a day and recording this data on their Sky Mural
- Viewing time-lapse videos to develop an understanding that Earth spins
- Considering how spinning affects what we see as they partner read the student book *What Spins?*
- Conducting hands-on activities designed to reinforce the idea that as Earth spins we face different directions and see differences in the sky

KEY


HANDS-ON


READING


STUDENT-TO-STUDENT DISCUSSION


TEACHER


TEACHER-LED DISCUSSION


WRITING

DAY 10 | LESSON 3.1

Investigating the Sunset

- Returning to Sai's Problem (5 min)
- Observing the Sunset (10 min)
- Making Sky Observations (20 min)
- Planning to Work as Scientists (10 min)

On-the-Fly Assessment

DAY 11 | LESSON 3.2

Observing the Horizon

- Observing Sai's Horizon (5 min)
- Observing the Horizon (20 min)
- Creating the Sky Mural Horizon Features (15 min)
- Preparing the Sky Mural (5 min)

DAY 12 | LESSON 3.3

The Sun's Position in the Sky

- Launching the Lesson (5 min)
- Observing the Sky in the Morning (20 min)
- Adding Data to the Sky Mural (5 min)
- Observing the Sky in the Afternoon (15 min)
- Adding New Data to the Sky Mural (5 min)

On-the-Fly Assessment

DAY 13 | LESSON 3.4

What Spins?

- Adding Sunset Data to the Sky Mural (15 min)
- Reading *What Spins?* (20 min)
- Observations While Spinning (10 min)

On-the-Fly Assessment

DAY 14 | LESSON 3.5

What We See as Earth Spins

- Watching Spinning Earth (10 min)
- Spinning Mount Nose (15 min)
- Reflecting on What We Know (5 min)
- Investigating a Pattern of the Moon (15 min)

On-the-Fly Assessment

DAY 15 | LESSON 3.6

Explaining Sunset to Sai

- Modeling Sai's Perspective (15 min)
- Explaining the Change from Daytime to Nighttime (10 min)
- Writing About the Change from Daytime to Nighttime (15 min)
- Reflecting on Our Work as Scientists (5 min)

Critical Juncture Assessment
Self-Assessment

Chapter 4:
The storyline gets more complex

What students investigate:

What will Sai see in the sky when he calls his grandma tomorrow?

What they figure out:

When Sai talks on the phone to his grandma at the same time tomorrow, he will see the same thing he saw in the sky today. The sun makes the same pattern in the sky every day because Earth spins one full time every day. This pattern lets us predict that Sai will see the sunset in the evening.

How they figure it out:

- Making additional observations of the sky, both at the same time as previous observations and at sunset
- Recording this new data on their Sky Mural and comparing it to previously recorded data
- Organizing data in a new way in order to notice patterns
- Learning about the work and discoveries of Lara Prugh, a scientist who studies nocturnal animals, during a shared reading of the big book *Nighttime Investigation*

KEY


HANDS-ON


READING


STUDENT-TO-STUDENT DISCUSSION


TEACHER


TEACHER-LED DISCUSSION


WRITING

DAY 16 | LESSON 4.1

Predicting Sun Patterns

- Planning How to Test Predictions (5 min)
- Observing the Sky in the Morning (15 min)
- Adding Data to the Sky Mural (5 min)
- Observing the Sky in the Afternoon (15 min)
- Adding New Data to the Sky Mural (5 min)

On-the-Fly Assessment

DAY 17 | LESSON 4.2

Nighttime Investigation

- Adding Sunset Data to the Sky Mural (5 min)
- Reading *Nighttime Investigation* (15 min)
- Discussing How to Organize Data (5 min)
- Reorganizing Sky Mural Data (15 min)

On-the-Fly Assessment

DAY 18 | LESSON 4.3

Explaining the Sun's Repeating Pattern

- Introducing a New Investigation Question (5 min)
- Revisiting *What Spins?* (15 min)
- Revisiting Spinning Mount Nose (15 min)
- Explaining the Sun's Repeating Pattern (10 min)

On-the-Fly Assessment

DAY 19 | LESSON 4.4

Explaining What Sai Will See

- Reflecting on What We Know (5 min)
- Writing to Sai (10 min)
- Mount Nose Reflection (5 min)
- Introducing the Mini-Book (10 min)
- Writing the Mini-Book (15 min)

Critical Juncture Assessment
Self-Assessment

Chapter 5: Application to a new context

What students investigate:

Why was it nighttime for Sai when he called his grandma during the winter?

What they figure out:

It was nighttime when Sai called his grandma during the winter because in winter, daytime is shorter and nighttime is longer than in other seasons.

How they figure it out:

- Gathering evidence about the seasons based on different patterns of sunlight as they partner read the student book *A Walk Through the Seasons*
- Observing the seasonal patterns to the length of daytime and nighttime over the course of a year

KEY


HANDS-ON


READING


STUDENT-TO-STUDENT DISCUSSION


TEACHER


TEACHER-LED DISCUSSION


WRITING

DAY 20 | LESSON 5.1

A Walk Through the Seasons

- Learning About Sai's Seasons Question (5 min)
- Reading *A Walk Through the Seasons* (15 min)
- Organizing Data from *A Walk Through the Seasons* (15 min)
- Discussing the Day in Different Seasons (10 min)

DAY 21 | LESSON 5.2

Exploring and Explaining Daylight in Different Seasons

- Analyzing Daytime and Nighttime Across Seasons (15 min)
- Discussing Daytime and Nighttime Across Seasons (15 min)
- Explaining Differences in Daytime and Nighttime (10 min)
- Reviewing the Unit (15 min)

On-the-Fly Assessment
Self-Assessment

DAY 22 | LESSON 5.3

End-of-Unit Assessment

- Talking with Students About Sky Patterns

End-of-Unit Assessment

All students. All standards.

Rather than treating the standards simply as a list of topics to cover, we designed Amplify Science California to allow for truly in-depth and integrated coverage of the disciplinary core ideas (DCIs), science and engineering practices (SEPs), and crosscutting concepts (CCCs). Unlike other programs, however, ours makes the NGSS' vision of "all students, all standards" a reality by creating a unit-specific learning progression for every unit called a Progress Build.

Each Progress Build defines several levels of understanding of the unit's anchoring phenomenon, with each level integrating and building upon the knowledge and skills from lower levels. In this way, each Progress Build provides a clear roadmap for how students' understanding of the phenomenon is expected to deepen and develop with each successive chapter and lesson.

What's more, the program's system of assessments is also tied to these Progress Builds. This carefully crafted integration provides teachers with credible, actionable, and timely diagnostic information about student progress toward the unit's learning goals and grade-level performance expectations. Armed with this powerful data, teachers have the ultimate flexibility to decide when to move on and when to slow down and dive deeper.

Spinning Earth Progress Build

The Progress Build in this unit consists of four levels of understanding. At each level, students add new ideas and integrate them into a progressively deeper understanding of why we observe daily cycles of day (when we see the sun in an arcing path across the sky) and night (when we see stars but not the sun).

Progress Build Level 1:
The sun is visible in the daytime; stars are visible in the nighttime.

Progress Build Level 2:
Facing or facing away from the sun changes what we see in the sky.

Progress Build Level 3:
Earth spins.

Progress Build Level 4:
Earth spins continuously.

Examples of differentiation in this unit

In addition to providing unit-specific Progress Builds that break learning goals into smaller, more achievable levels of understanding, Amplify Science California makes learning accessible for all students through a variety of scaffolds, supports, and differentiation strategies for every lesson. **For a complete list of strategies, see the Differentiation section of every Lesson Brief**.

Below are a few examples of strategies embedded in this unit.

For English learners:

Previewing the video (Example from Lesson 2.1)
As a way to support English learners, you may wish to preview the *Zoom Out to Space* and *Earth in Space* videos with them. Invite students to use their primary language(s) to describe what they observe in the videos. Have students compare what they observe in each video. Point out the different perspectives that each video highlights. For instance, in the *Zoom Out to Space* video, point out that the video shows a close-up perspective of Earth and then zooms out far enough to see Earth in its entirety. Guide students to discuss their observations for each video. You may want to invite these students to join a group with students who speak the same primary language.

For students needing more support:

Additional practice with making and recording observations (Example from Lesson 3.1)
At this point in the unit, students have made observations multiple times, including observations of the sky. However, you might find it helpful to review how to make close observations and record those observations with students before bringing them outside. Use an object or space in the classroom to practice making observations with students. Point to the object or space that you selected and model looking closely at the object or space. Talk aloud to model making observations, pointing out details of the object or space. Record (with drawings and labels) your observations on the board.

For students ready for a challenge:

Create visual representations (Example from Lesson 5.1)
In Activity 3, students create drawings of the sun in the morning and evening in different seasons based on what they read in *A Walk Through the Seasons*. For students who may finish this activity early and could use additional challenge, have them consider how they could represent the data in the data table using words instead of drawings. On a piece of chart paper, draw a data table with three columns and five rows. In the first row of the second column, write "morning," and in the first row of the third column, write "evening." Starting in the second row of the first column, label the beginning of each row "spring," "summer," "fall," and "winter." Have students work together to use descriptive words to complete this table.

3-D Statements

In order to help teachers recognize the three-dimensional structure of every unit, chapter, and lesson, each unit contains a 3-D Statement document that makes the integration clear.

Making the 3-D statement document all the more effective, the three dimensions are color-coded for easy recognition.

Spinning Earth 3-D Coverage

SEPs
Science and Engineering Practices

DCIs
Disciplinary Core Ideas

CCCs
Cross-Cutting Concepts

Unit Level

Students collect and analyze data from firsthand investigations and secondary sources to explain why we see the patterns that are visible in the daytime and nighttime sky (patterns, cause and effect, systems and system models).

Chapter Level

Chapter 1: Why did the sky look different to Sai than to his grandma?

Students collect and analyze data about what the sky looks like during the daytime and during the nighttime (patterns, cause and effect).

Chapter 2: Why was it daytime for Sai when it was nighttime for his grandma?

Students gather evidence from multiple sources to construct an explanation that it is daytime in a place on Earth facing the sun when it is nighttime in a place on Earth not facing the sun (patterns, cause and effect, systems and system models).

Chapter 3: Why did daytime change to nighttime while Sai talked on the phone?

Students collect, organize, and analyze data from repeated sky observations, concluding that the sun and the Moon both appear to move in a pattern across the sky throughout the day because Earth spins (patterns, cause and effect, systems and system models).

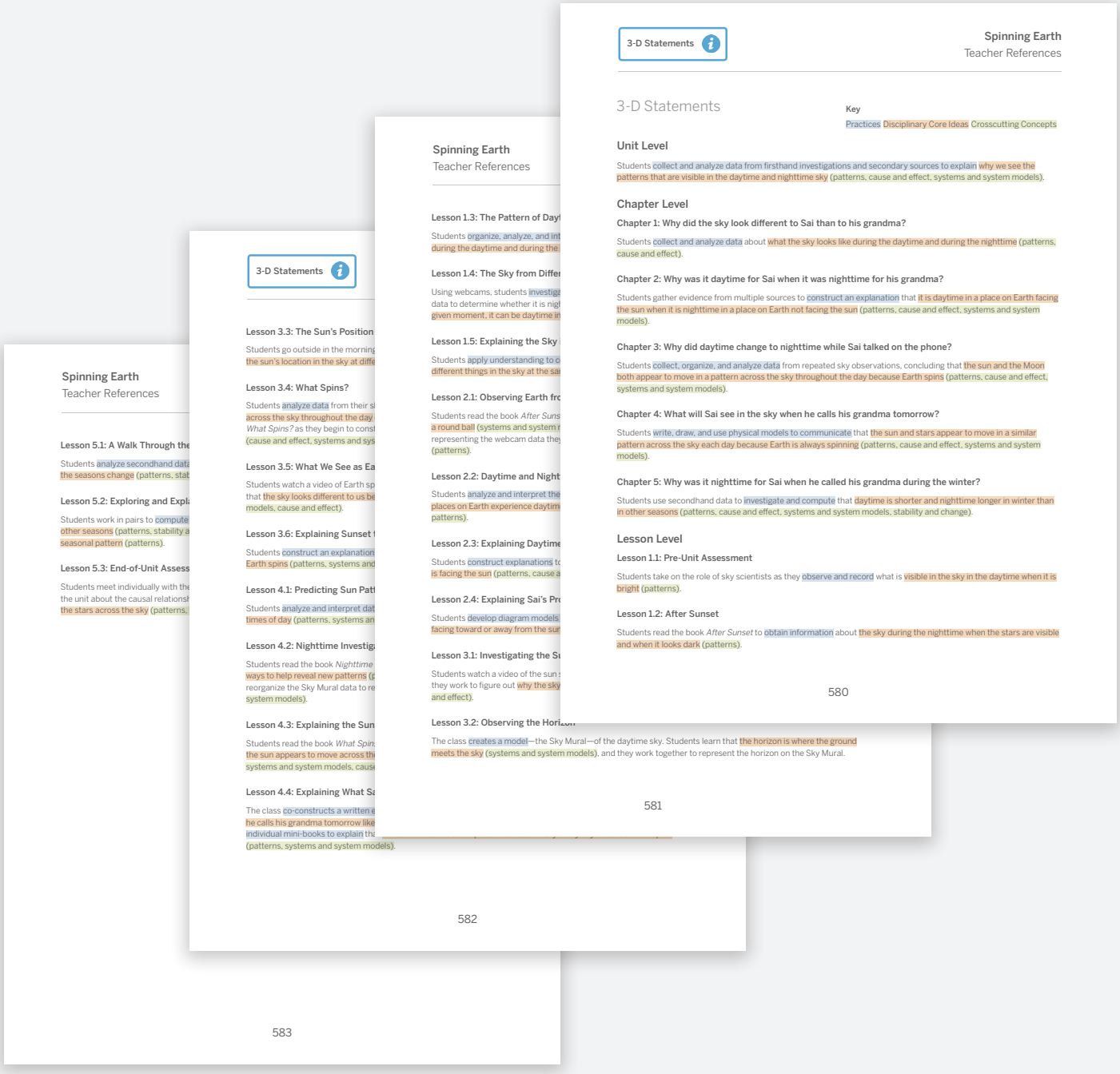
Chapter 4: What will Sai see in the sky when he calls his grandma tomorrow?

Students write, draw, and use physical models to communicate that the sun and stars appear to move in a similar pattern across the sky each day because Earth is always spinning (patterns, cause and effect, systems and system models).

Chapter 5: Why was it nighttime for Sai when he called his grandma during the winter?

Students use secondhand data to investigate and compute that daytime is shorter and nighttime longer in winter than in other seasons (patterns, cause and effect, systems and system models, stability and change).

To review the 3-D Statements at the lesson level, see the Lesson Brief section of every lesson.



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