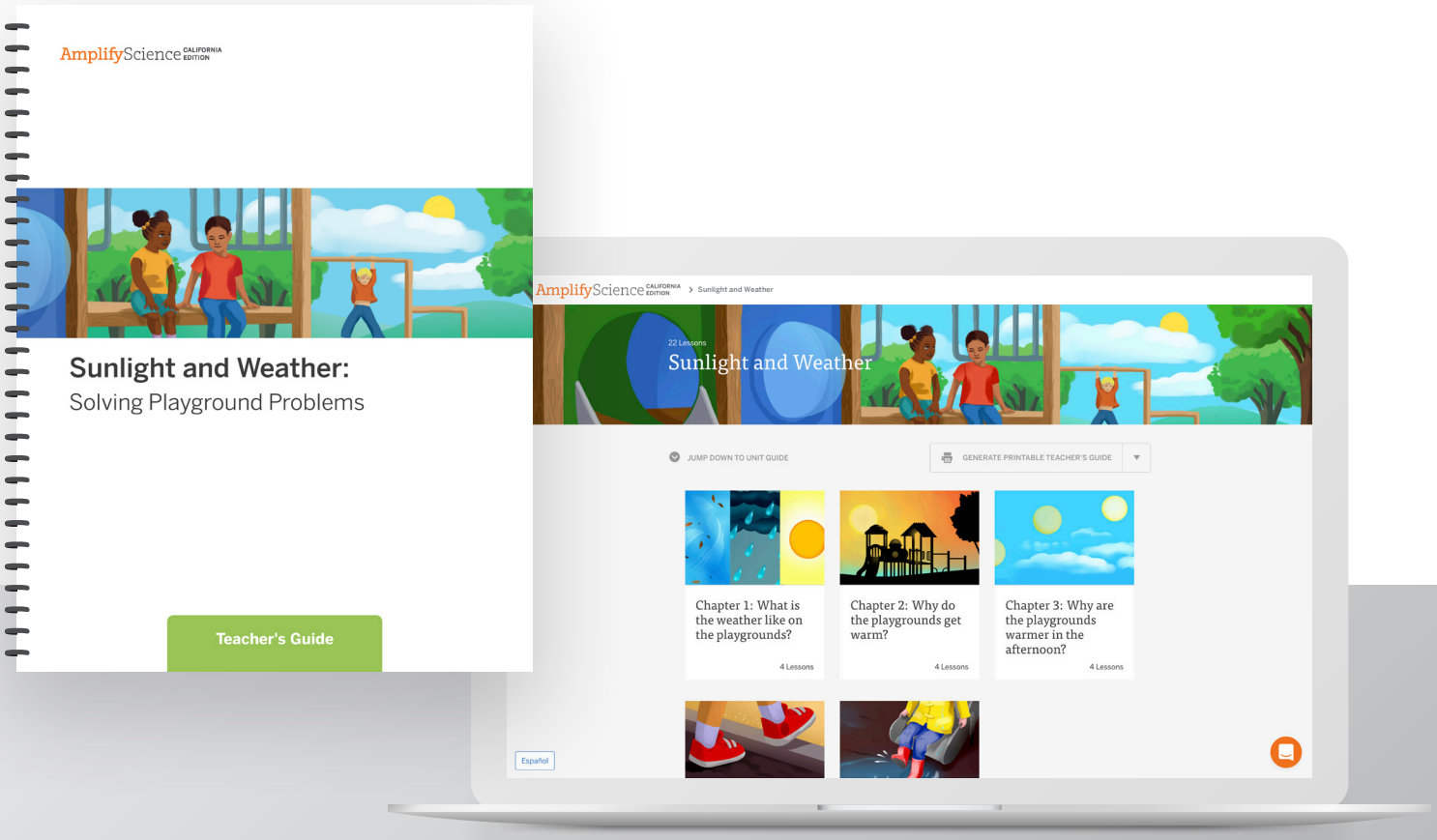
Amplify Science CALIFORNIA

Kindergarten

UNIT GUIDE

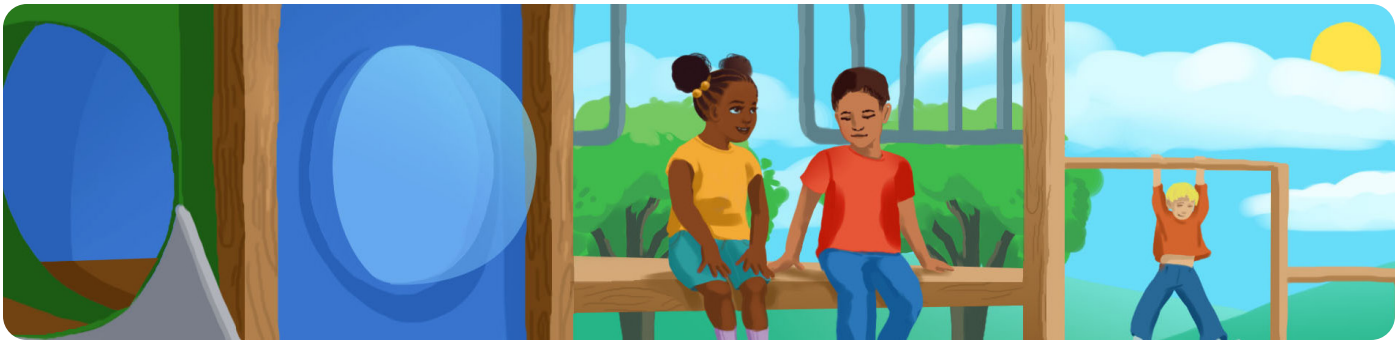
Sunlight and Weather



Amplify.

THE LAWRENCE HALL OF SCIENCE
UNIVERSITY OF CALIFORNIA, BERKELEY

Table of contents



Welcome to Sunlight and Weather

When it comes to weather, what seems intuitive to adults is not always clear to young students. For example, kindergarteners may not immediately know that sunlight warms surfaces, that more time spent in sunlight can cause surfaces to become warmer, or that dark surfaces tend to become warmer than pale surfaces. Due to the fact that the warming of Earth's surface by sunlight is the origin of all weather events, and because it also serves as the foundation for figuring out other Earth Science phenomena in later grades, Amplify Science California takes extra care to ensure that kindergarteners develop a solid understanding of these essential concepts.

> 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 weather scientists. Their job is to help the principals of Woodland Elementary and Carver Elementary figure out why Woodland's playground is warmer than Carver's at recess. Working together, students gather data from models of the sun and Earth's surface and observe their own playgrounds to figure out how sunlight causes changes in the temperatures of different surfaces. By the end of the unit, they use their new understanding of sunlight and weather to figure out why Woodland's playground sometimes floods.

Unit Type: Modeling

Student Role: Weather Scientists

Phenomenon: Students at Carver Elementary School are too cold during morning recess, while students at Woodland Elementary School are too hot during afternoon recess.

Core Concept: Understanding the mechanism underlying all weather—how the sun warms Earth's surface

Target Performance Expectations:

- K-PS3-1: Sunlight on Earth's Surface
- K-PS3-2: Reducing Warming
- K-ESS2-1: Weather Patterns
- K-ESS3-2: Preparing for Severe Weather
- K-2-ETS1-1: Defining the Problem
- K-2-ETS1-2: Developing Possible Solutions
- K-2-ETS1-3: Comparing Different Solutions

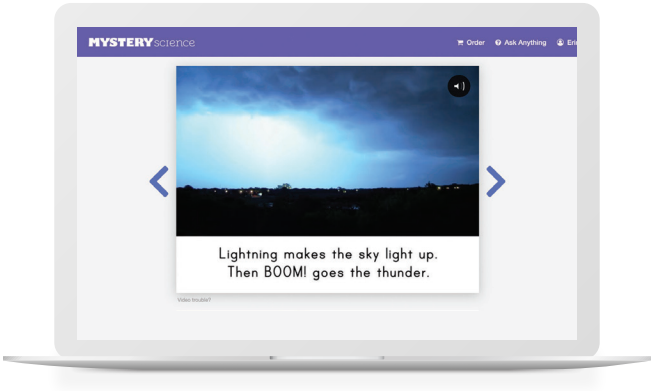
Students figure out the unit phenomenon through the use of a variety of resources.

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 K, these activities are limited to digital readers and other media (i.e., videos, images).

About reading in this unit:
In grade K, 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:

What is the weather like on the playgrounds?

What they figure out:

The weather at Carver Elementary and Woodland Elementary is similar. Both schools have many sunny days and some cloudy, windy, or rainy days. The type of weather at each school must not be causing the difference in their playgrounds' temperatures.

How they figure it out:

- Observing and recording the weather at their own school
- Considering a variety of ideas—weather can change from day-to-day and throughout the year, there are ways people can prepare for the weather, there are special words that we use to describe the weather, and there are special tools that we use to measure the temperature—during a read aloud of the big book *What Is the Weather Like Today?*
- Constructing graphs to analyze weather data from each school

KEY


CLASS


HANDS-ON


READING


STUDENT-TO-STUDENT DISCUSSION


TEACHER-LED DISCUSSION


WRITING

DAY 1 | LESSON 1.1

What Is the Weather Like Today?

- Introducing the Unit (10 min)
- Reading *What Is the Weather Like Today?* (15 min)
- Introducing Think and Walk (10 min)
- Recording New Ideas (10 min)

DAY 2 | LESSON 1.2

Introducing Temperature

- Observing Local Weather (15 min)
- Revisiting *What Is the Weather Like Today?* (10 min)
- Measuring Temperature (15 min)
- Recording Ideas About Temperature (5 min)

On-the-Fly Assessment
Self-Assessment

DAY 3 | LESSON 1.3

Pre-Unit Assessment

- Observing Local Weather (15 min)
- Recording Local Weather (10 min)
- Introducing the What Scientists Do Chart (10 min)
- Introducing and Discussing the Playground Problem (10 min)

Pre-Unit Assessment

DAY 4 | LESSON 1.4

Weather and the Playgrounds

- Graphing Playground Weather Data (15 min)
- Discussing Playground Weather Graphs (15 min)
- Writing About Playground Weather (15 min)

Chapter 2:
The storyline builds

What students investigate:

Why do the playgrounds get warm?

What they figure out:

The surfaces of the playgrounds get warm because sunlight shines on their surfaces during the day.

How they figure it out:

- Using models of the sun and of Earth's surface to measure the temperature of a surface when light is and is not shining on it
- Learning about how scientists use models during a shared reading of the big book *Handbook of Models*
- Measuring the temperature of their own playground surface in sunlight and in shade
- Acting out how sunlight shining on a surface makes the surface warmer

KEY


CLASS


HANDS-ON


READING


STUDENT-TO-STUDENT DISCUSSION


TEACHER-LED DISCUSSION


WRITING

DAY 5 | LESSON 2.1

Modeling the Sun Warming Earth's Surface

- Returning to the Playground Problem (10 min)
- Getting Started with the Warming Model (15 min)
- Analyzing the Warming Model (10 min)
- Recording Model Results (10 min)

On-the-Fly Assessment

DAY 6 | LESSON 2.2

Learning More About Models

- Graphing Results of the Warming Model (10 min)
- Reading About Models of Big Things (15 min)
- Measuring the Outside Temperature (15 min)
- Recording Data on Class Temperature Chart (5 min)

DAY 7 | LESSON 2.3

Investigating Sunlight on Earth's Surface

- Surfaces In and Out of Sunlight (5 min)
- Comparing Sun and Shade Outside (20 min)
- Playing the Sunlight Game (15 min)
- Recording New Ideas (5 min)

On-the-Fly Assessment

DAY 8 | LESSON 2.4

Applying Sunlight Warming Earth's Surface

- Think and Walk (15 min)
- Reflecting on Sunlight Warming Earth's Surface (5 min)
- Interpreting the Playground Temperature Data (10 min)
- Explaining Sunlight Warming Earth's Surface (15 min)

On-the-Fly Assessment
Critical Juncture Assessment
Self-Assessment

Chapter 3:
The storyline goes deeper

What students investigate:

Why are the playgrounds warmer in the afternoon?

What they figure out:

The playgrounds at both schools are warmer in the afternoon than in the morning because sunlight has been shining on the surfaces for a longer time.

How they figure it out:

- Considering the idea that pale-colored surfaces and dark-colored surfaces warm up at different rates as they follow a lizard through his day during a shared reading of the big book *Getting Warm in the Sunlight*
- Using models to measure the temperature of a surface as light shines on it for different lengths of time
- Analyzing morning and afternoon temperature data from their own playground
- Acting out how sunlight shining on a surface over time makes it get warmer and warmer

KEY


CLASS


HANDS-ON


READING


STUDENT-TO-STUDENT DISCUSSION


TEACHER-LED DISCUSSION


WRITING

DAY 9 | LESSON 3.1

Getting Warm in the Sunlight

- Returning to the Playground Problem (5 min)
- Reading *Getting Warm in the Sunlight* (15 min)
- Discussing the Model Setup (10 min)
- Gathering Data From the Warming Over Time Model (15 min)

On-the-Fly Assessment

DAY 10 | LESSON 3.2

Discussing Warming Over Time

- Graphing the Warming Over Time Model Results (10 min)
- Discussing the Warming Over Time Graph (15 min)
- Exploring the Playground Temperature Chart (10 min)
- Reading About Models of Fast and Slow Things (10 min)

On-the-Fly Assessment

DAY 11 | LESSON 3.3

Showing Ideas About Warming Over Time

- Playing the Sunlight Over Time Game (15 min)
- Recording New Ideas About Warming Over Time (5 min)
- Introducing the Mini-Book (15 min)
- Partner Reading (10 min)

On-the-Fly Assessment

DAY 12 | LESSON 3.4

Reflecting on Warming Through Time

- Think and Walk: Longer or Shorter Time (15 min)
- Reflecting on Warming Over Time (5 min)
- Interpreting the New Playground Data (10 min)
- Explaining Warming Over Time (15 min)

On-the-Fly Assessment
Critical Juncture Assessment
Self-Assessment

Chapter 4:
The storyline gets more complex

What students investigate:

Why is Woodland Elementary School's playground always warmer during recess?

What they figure out:

Woodland Elementary's playground has a darker surface than Carver Elementary's playground. Woodland's playground is warmer because dark surfaces get warmer than pale surfaces when the sun shines on them.

How they figure it out:

- Using models to measure the temperature of dark and pale surfaces as light shines on them
- Comparing the temperatures of dark and pale surfaces on their own playgrounds
- Evaluating how possible solutions affect the temperature on each playground
- Exploring seven locations around the world where people use different techniques to deal with a particular type of severe weather—very high temperatures—during a shared reading of the big book *Cool People in Hot Places*

KEY


CLASS


HANDS-ON


READING


STUDENT-TO-STUDENT DISCUSSION


TEACHER-LED DISCUSSION


WRITING

DAY 13 | LESSON 4.1

Modeling Warming of Different Surfaces

- Returning to the Playground Problem (15 min)
- Revisiting *Getting Warm in the Sunlight* (20 min)
- Planning to Investigate (10 min)
- Gathering Data from the Colored Surfaces Model (10 min)

On-the-Fly Assessment

DAY 14 | LESSON 4.2

Reflecting on Warming of Different Surfaces

- Graphing the Colored Surfaces Model Results (15 min)
- Returning to the Reference Book (10 min)
- Investigating Dark and Pale Surfaces Outside (15 min)
- Recording New Ideas About Different Surfaces (5 min)

On-the-Fly Assessment

DAY 15 | LESSON 4.3

Cool People in Hot Places

- Think and Walk (15 min)
- Explaining Warming of Different Surfaces (15 min)
- Reading *Cool People in Hot Places* (15 min)

On-the-Fly Assessment
Critical Juncture Assessment
Self-Assessment

DAY 16 | LESSON 4.4

Revisiting Sunlight Warming Earth's Surface

- Discussing Changes to the Playground (15 min)
- Writing About Changes to the Playground (10 min)
- Mini-Book 2: *Getting Warmer or Cooler at the Beach* (15 min)
- Reading *Getting Warmer or Cooler at the Beach* (5 min)

On-the-Fly Assessment

Chapter 5: Application to a new context

What students investigate:

Why does only Woodland Elementary School's playground flood?

What they figure out:

Woodland's playground floods after severe rain because it has a solid surface that does not absorb water, while Carver's playground has a gravel surface that rainwater can soak into.

How they figure it out:

- Learning about real-life weather scientist Lynn Burse and how she studies and predicts severe weather during a read aloud of the big book *Tornado! Predicting Severe Weather*
- Using models to test four differences between the two playgrounds that could cause flooding
- Evaluating solutions that would help Woodland prepare for severe rain in the future
- Creating posters describing preparations for other kinds of severe weather

KEY


CLASS


HANDS-ON


READING


STUDENT-TO-STUDENT DISCUSSION


TEACHER-LED DISCUSSION


WRITING

DAY 17 | LESSON 5.1

Tornado! Predicting Severe Weather

- Reading *Tornado! Predicting Severe Weather* (15 min)
- Think and Walk (10 min)
- Introducing the New Playground Problem (10 min)
- Identifying Differences Between the Playgrounds (10 min)

DAY 18 | LESSON 5.2

Investigating with the Flooding Models

- Discussing Playground Differences (10 min)
- Setting Up the Flooding Models (15 min)
- Investigating the Flooding Models (10 min)
- Observing the Flooding Models (10 min)

On-the-Fly Assessment

DAY 19 | LESSON 5.3

Discussing the Flooding Models

- Discussing Flooding Models in Pairs (10 min)
- Discussing Flooding Models as a Class (10 min)
- Shared Writing About the Flooding Playgrounds (10 min)
- Returning to the *Handbook of Models* (10 min)

DAY 20 | LESSON 5.4

Investigating Flooding Solutions

- Revisiting *Tornado! Predicting Severe Weather* (15 min)
- Brainstorming Flooding Solutions (5 min)
- Investigating Flooding Solutions (15 min)
- Writing About Flooding Solutions (10 min)

DAY 21 | LESSON 5.5

Reflecting on Weather and Sunlight

- Preparing for Severe Weather (5 min)
- Creating Weather Preparation Posters (20 min)
- Presenting Weather Preparation Posters (5 min)
- Reflecting on the Unit (15 min)

On-the-Fly Assessment
Self-Assessment

DAY 22 | LESSON 5.6

End-of-Unit Assessment

- Talking About the Playgrounds' Temperatures (20 min)

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.

Sunlight and Weather Progress Build

The Progress Build in this unit consists of three levels of understanding. At each level, students add new ideas and integrate them into a progressively deeper understanding of why a dark Earth surface is warmer than a pale Earth surface, even as both surfaces get warmer over the course of the day.

Progress Build Level 1:
Surfaces get warm in sunlight.

Progress Build Level 2:
Temperature increases with time in sunlight.

Progress Build Level 3:
Dark-colored surfaces get warmer in sunlight.

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:

Additional modeling (Example from Lesson 3.1)
In Activity 4, after observing the temperature of the rubber surfaces at different timepoints, the class will discuss which time period is shorter, and which is longer. To do this, students need to use comparative language to discuss time, which may be new to some English learners. You can model language to use (shorter and longer) by comparing two familiar classroom items, such as two pencils. Then, use the same language to model comparing the time the light is shining.

For students needing more support:

Build background knowledge (Example from Lesson 5.1)
If you live in a region that does not experience tornados, students may have a difficult time visualizing the severe form of weather discussed in the book. To support students' understanding, you may wish to do a brief demonstration using an electric fan. Turn the fan on its lowest speed, and let students know that this represents a normal windy day. Then, increase the fan speed by one setting, and explain that this represents the wind getting stronger. Increase it to its highest setting and point out that this represents tornado speed—severe weather. You may wish to search online for video clips of tornados for students to watch as well.

For students ready for a challenge:

Further investigation (Example from Lesson 1.4)
You may wish to ask students to create a calendar to show the weather for your school for several weeks or an entire month. Students could gather the data about the weather and then transfer it to a graph similar to the graphs they created in Activity 1. As a further extension, you could provide students with copies of the Carver and Woodland weather calendars and ask them to compare the weather data they collected at your school with the weather data from Carver and Woodland schools. Prompt them to compare the number of days each type of weather was observed.

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.

Sunlight and Weather 3-D Coverage

SEPs
Science and Engineering Practices

DCIs
Disciplinary Core Ideas

CCCs
Cross-Cutting Concepts

Unit Level

Students use models and collect and analyze data to determine the effect of sunlight on Earth's surfaces. They do this to explain what is causing two school playgrounds to be different temperatures (cause and effect, energy and matter). Students also obtain information and communicate ideas about severe weather and ways to prepare for it (patterns).

Chapter Level

Chapter 1: What is the weather like on the playgrounds?

Students obtain information about different types of weather (patterns) and collect, interpret, and analyze temperature data from Carver and Woodland Elementary Schools to help determine that weather is not the cause of temperature differences on the schools' playgrounds (cause and effect; scale, proportion, and quantity).

Chapter 2: Why do the playgrounds get warm?

Students obtain information and use models to investigate and explain that sunlight causes surfaces to get warm, and playground surfaces are warmer in the daytime than in the nighttime (energy and matter).

Chapter 3: Why are the playgrounds warmer in the afternoon?

Students obtain information and use models to investigate how sunlight causes surfaces to get warmer over time (scale, proportion, and quantity; energy and matter). Students apply information and results from investigations to describe why Carver's and Woodland's playgrounds are warmer in the afternoon than in the morning (cause and effect, patterns).

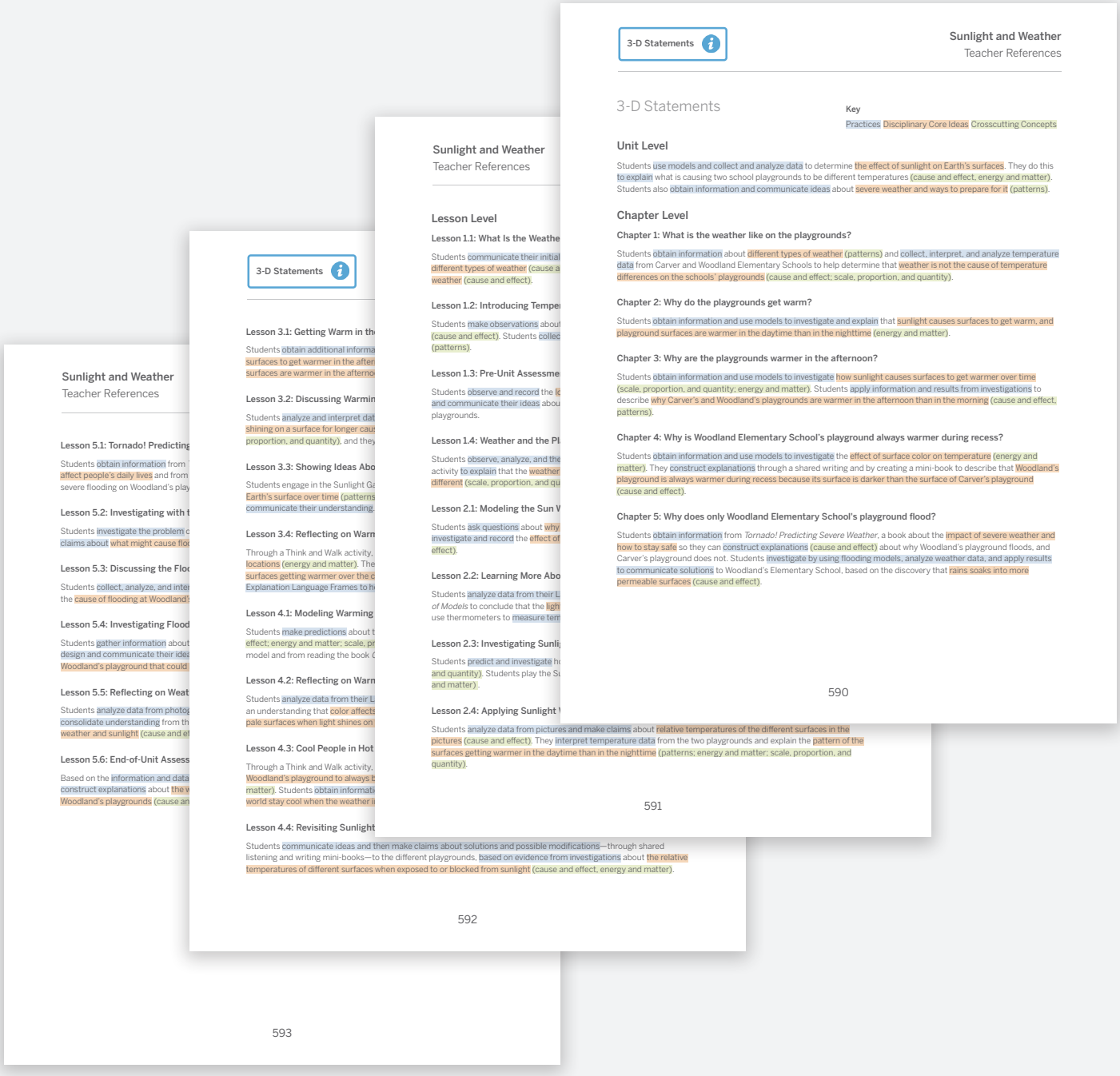
Chapter 4: Why is Woodland Elementary School's playground always warmer during recess?

Students obtain information and use models to investigate the effect of surface color on temperature (energy and matter). They construct explanations through a shared writing and by creating a mini-book to describe that Woodland's playground is always warmer during recess because its surface is darker than the surface of Carver's playground (cause and effect).

Chapter 5: Why does only Woodland Elementary School's playground flood?

Students obtain information from *Tornado! Predicting Severe Weather*, a book about the impact of severe weather and how to stay safe so they can construct explanations (cause and effect) about why Woodland's playground floods, and Carver's playground does not. Students investigate by using flooding models, analyze weather data, and apply results to communicate solutions to Woodland's Elementary School, based on the discovery that rains soaks into more permeable surfaces (cause and effect).

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



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