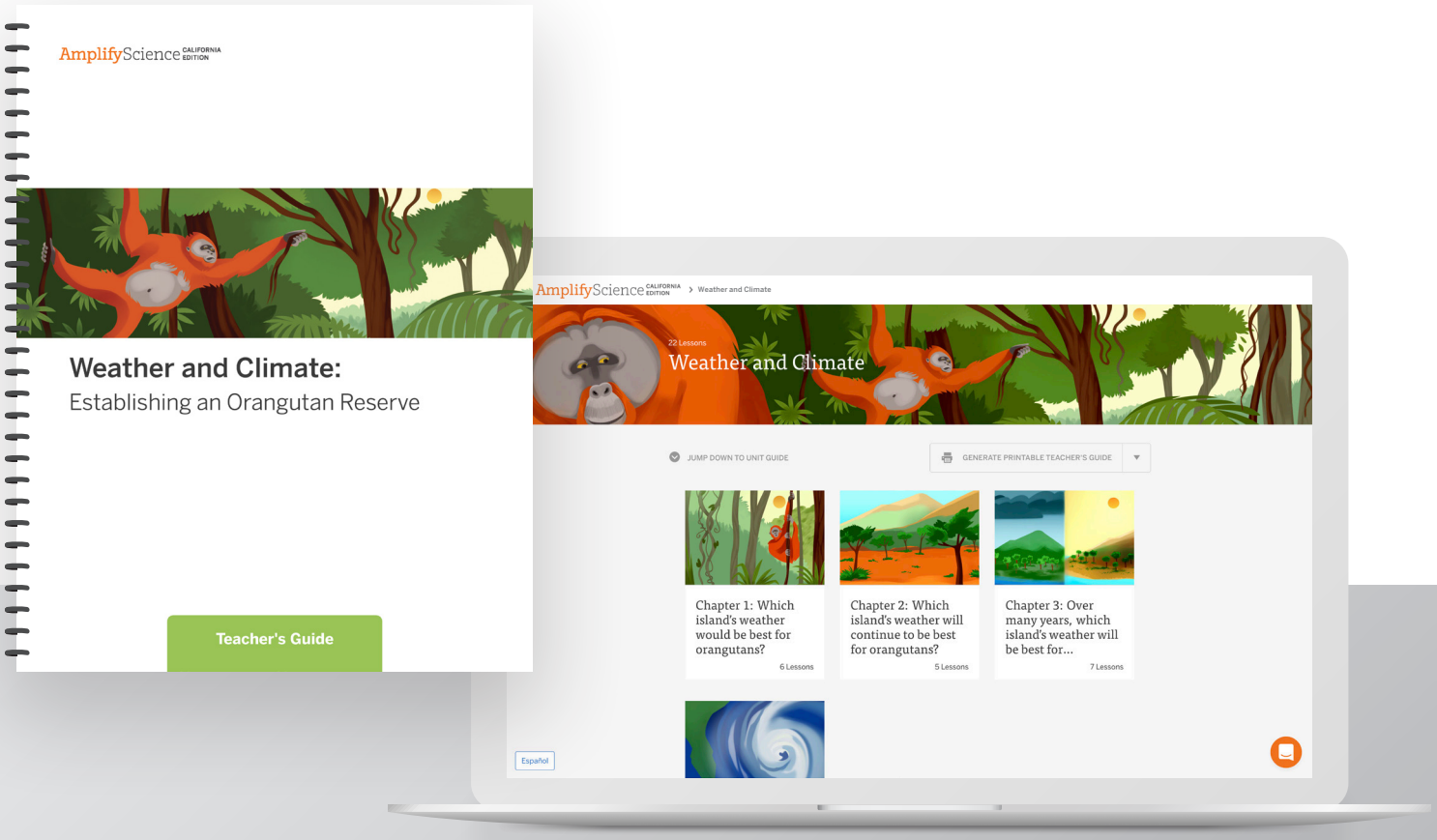
Amplify Science
CALIFORNIA

Grade 3

UNIT GUIDE

Weather and Climate



Amplify.

THE LAWRENCE HALL OF SCIENCE
UNIVERSITY OF CALIFORNIA, BERKELEY

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Welcome to Weather and Climate

Weather is one of the most pervasive phenomena humans interact with on a daily basis, and it has a profound impact on how all organisms on Earth live. However, few programs provide students with a compelling reason to figure out weather and climate patterns in places where they don't live. By anchoring learning around suitable locations where orangutans can live, Amplify Science California heightens students' engagement and sense of purpose as they take on finding a solution to the unit's problem.

> 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 meteorologists. Their job is to help the fictional Wildlife Protection Organization (WPO) investigate weather patterns as they solve the problem of where to establish an orangutan reserve. Working together, they analyze the weather on three fictional islands in order to determine which has weather most like the locations where orangutans live. By the end of the unit, students shift their focus from *when* weather patterns occur to thinking about *where* different weather events happen repeatedly as they investigate how the WPO can prepare for natural hazards that might damage their offices.

Unit Type: Argumentation

Student Role: Meteorologists

Phenomenon: Three different islands, each a contender for becoming an Orangutan reserve, experience different weather patterns.

Core Concept: Understanding how weather measurements need to be recorded in order to compare data and the extent to which data from different time periods can reveal weather patterns that allow for predictions

Target Performance Expectations:

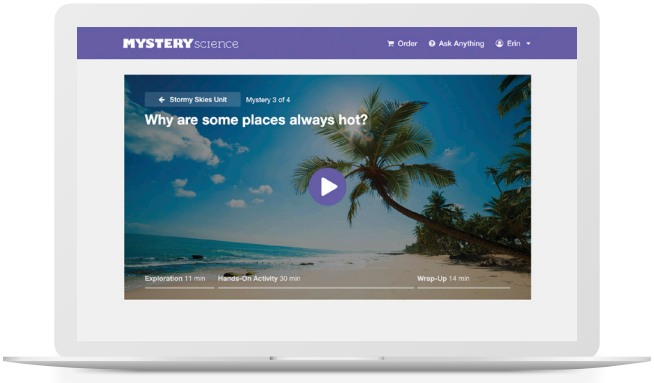
- 3-ESS2-1: Represent Weather Patterns
- 3-ESS2-2: Describe Climates
- 3-ESS3-1: Reducing Impact of Weather Hazards
- 3-5-ETS1-2: Developing Possible Solutions

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

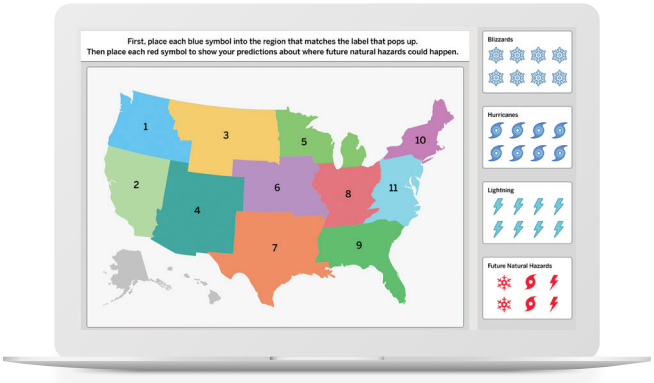
Student Books

Hands-On Kit

Videos



Practice Tools



About technology in this unit:
Amplify Science California gives you the flexibility to use technology in the way that meets your needs best. In 3–5, 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 3, technology-based activities include Practice Tools and some digital Simulations. In this particular unit, only 4 of the 22 lessons incorporate the use of devices with only 4% of the unit's activities involving the use of a digital tool.

When the use of a digital tool is called for in a lesson, teachers have several implementation options:

- **If limited student devices are available,** students can do activities in pairs or small groups.
- **If no student devices are available,** teachers can project the digital tool to the class and create a whole class experience.

Chapter 1: The storyline begins

What students investigate:

Which island's weather would be best for orangutans?

What they figure out:

The reserve should be built on Blue Island because it had the hottest temperature and the most rain on the day that data was measured.

How they figure it out:

- Conducting hands-on investigations
- Taking and comparing weather measurements
- Exploring weather data, analyzing graphs, and identifying a variety of seasonal patterns as they read the student book *World Weather Handbook*
- Reading about a boy who collects and records weather data each day for a week from his home in western Colorado in the student book *Sky Notebook*
- Engaging in oral and written argumentation about weather data from Arc, Blue, and Creek Islands—the fictional islands proposed for the orangutan reserve

KEY


CLASS


HANDS-ON


MODELING


READING


STUDENT-TO-STUDENT DISCUSSION


TEACHER


TEACHER-LED DISCUSSION


WRITING

DAY 1 | LESSON 1.1

Pre-Unit Assessment

- Introducing the Orangutan Reserve (10 min)
- Introducing Weather (20 min)
- Pre-Unit Assessment (20 min)
- Introducing Investigation Notebooks (10 min)

Pre-Unit Assessment

DAY 2 | LESSON 1.2

Measuring Rainfall

- Discussing Island Data (15 min)
- Measuring Rainfall (30 min)
- Discussing Measurement Method (15 min)

On-the-Fly Assessment

DAY 3 | LESSON 1.3

Measuring Temperature

- Temperature Investigation (20 min)
- Measurement with Thermometers (5 min)
- Visualizing Temperatures (10 min)
- Visualizing with *World Weather Handbook* (10 min)

DAY 4 | LESSON 1.4

Sky Notebook

- Introducing *Sky Notebook* (10 min)
- Partner Reading (30 min)
- Local Weather Data Collection Routine (30 min)

On-the-Fly Assessment

DAY 5 | LESSON 1.5

Making Sense of Weather Data

- Visualizing Precipitation (15 min)
- Introducing Evidence (10 min)
- Evaluating Evidence (25 min)
- Reflecting on Evidence (10 min)

Critical Juncture Assessment

DAY 6 | LESSON 1.6

Writing Island Arguments

- Evidence Circles (25 min)
- Choosing a Claim (10 min)
- Shared Writing (25 min)

On-the-Fly Assessment
Self-Assessment

Chapter 2:
The storyline builds

What students investigate:

Which island's weather will continue to be best for orangutans?

What they figure out:

The reserve should be built on Creek Island because it had the highest temperature range and highest amount of total rainfall over the month of available data.

How they figure it out:

- Analyzing and interpreting sets of data
- Creating and interpreting line plots to find the temperature range for given locations
- Using a digital modeling tool to recognize patterns from which they can make predictions
- Considering how numbers— and various ways of organizing them— reveal information about weather as they read the student book *Seeing the World Through Numbers*
- Analyzing data to make a claim about which island will continue to have the best weather for the orangutan reserve

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WRITING

DAY 7 | LESSON 2.1

Introducing Line Plots

- Discussing New Island Data (10 min)
- Creating a Line Plot of Orangutan Heights (25 min)
- Male and Female Orangutan Line Plots (25 min)

DAY 8 | LESSON 2.2

Seeing the World Through Numbers

- Reviewing the Visualizing Strategy (15 min)
- Partner Reading (35 min)
- Describing a Month's Rainfall (10 min)

On-the-Fly Assessment

DAY 9 | LESSON 2.3

Finding Ranges for Temperature Data

- Comparing Temperature Ranges (25 min)
- Analyzing Patterns (25 min)
- Examining Weather Data for Bintulu (10 min)

On-the-Fly Assessment

DAY 10 | LESSON 2.4

Evaluating Island Weather Evidence

- Identifying Strong vs. Weak Evidence (15 min)
- Evaluating Evidence (30 min)
- Local Temperature Range (15 min)

Critical Juncture Assessment

Optional Flextension: *Designing Wind-Measurement Tools*

DAY 11 | LESSON 2.5

Revisiting Island Arguments

- Evidence Circles (20 min)
- Choosing a Claim (10 min)
- Writing Scientific Arguments (30 min)

On-the-Fly Assessment

Self-Assessment

Chapter 3:
The storyline goes deeper

What students investigate:

Over many years, which island's weather will be best for orangutans?

What they figure out:

The reserve should be built on Arc Island because one year of data reveals that Arc Island has a consistent seasonal pattern: It is warm and rainy throughout the year, while Blue Island has a dry season and Creek Island has a cold season.

How they figure it out:

- Tracking data related to durian fruit
- Using bar graphs to analyze data over time
- Learning about seasonal patterns as they read the student book *What's Going On with the Weather?*
- Applying their understanding of seasonal patterns to argue which island will have the best weather for orangutans over the long term

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TEACHER-LED DISCUSSION


WRITING

DAY 12 | LESSON 3.1

Analyzing a Year of Data

- Discussing More Island Data (10 min)
- Durian Bar Graph (25 min)
- From Line Plots to Bar Graphs (25 min)

DAY 13 | LESSON 3.2

Discovering Climate Through Data

- Analyzing Monthly Temperature Changes (15 min)
- Patterns in Data (20 min)
- Predicting Temperature Patterns (25 min)

On-the-Fly Assessment

DAY 14 | LESSON 3.3

Seasons and Climate

- Working with Averages (20 min)
- Precipitation Patterns (20 min)
- Introducing Seasons (20 min)

On-the-Fly Assessment

DAY 15 | LESSON 3.4

What's Going On with the Weather?

- Modeling How to Visualize with Bar Graphs (10 min)
- Partner Reading (30 min)
- Discussing Seasons (20 min)

On-the-Fly Assessment

DAY 16 | LESSON 3.5

Comparing Climates

- Seasonal Patterns in *World Weather Handbook* (30 min)
- Graphing the Local Climate (20 min)
- Reflective Writing (10 min)

Critical Juncture Assessment

DAY 17 | LESSON 3.6

Evaluating Evidence About Climate

- Visualizing Local Weather in the Future (25 min)
- Identifying Strong vs. Weak Evidence (10 min)
- Evaluating Evidence (25 min)

On-the-Fly Assessment

DAY 18 | LESSON 3.7

End-of-Unit Assessment Part 1

- Evidence Circles (20 min)
- Choosing a Claim (10 min)
- Writing Arguments (30 min)

End-of-Unit Assessment Part 1 Self-Assessment

Chapter 4: Application to a new context

What students investigate:

How can the WPO prepare for natural hazards that might damage their offices?

What they figure out:

Weather-related natural hazards include blizzards, hurricanes, and lightning strikes. It's possible to implement a variety of protective measures for buildings that can minimize damage from these severe weather events. The Wildlife Protection Organization's office building in Florida has already been damaged by a hurricane. Since this area also has a history of lightning strikes, students recommend solutions that could prevent future damage.

How they figure it out:

- Investigating patterns related to where weather-related natural hazards occur by using digital tools, maps, and resources in books
- Learning about some of the problems that natural hazards can cause as well as solutions that people have designed to prepare for those problems as they read the student book *Dangerous Weather Ahead*
- Building and testing solutions that can minimize wind and water damage from hurricanes
- Recommending preparatory actions that the Wildlife Protection Organization should take when they rebuild

KEY


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TEACHER


TEACHER-LED DISCUSSION


WRITING

DAY 19 | LESSON 4.1

Regional Climate Patterns

- Introducing the Problem of Natural Hazards (15 min)
- Mapping Natural Hazards (20 min)
- Temperatures on the World Map (25 min)

DAY 20 | LESSON 4.2

Dangerous Weather Ahead

- Discussing Natural Hazards (15 min)
- Partner Reading (35 min)
- Predicting Nearby Natural Hazards (10 min)

On-the-Fly Assessment

DAY 21 | LESSON 4.3

Preparing for National Hazards

- From Predicting to Preparing (10 min)
- Building Solutions (30 min)
- Testing Solutions (20 min)

DAY 22 | LESSON 4.4

End-of-Unit Assessment Part 2

- Evidence Circles (20 min)
- Writing a Recommendation (15 min)
- Reflecting on the Unit (25 min)

End-of-Unit Assessment Part 2 Self-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.

Weather and Climate 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 how weather measurements need to be recorded in order to compare data and the extent to which data from different time periods can reveal weather patterns that allow for predictions.

Progress Build Level 1:

Weather is measured in the same way to allow for comparisons.

Progress Build Level 2:

The pattern to the weather over a month allows for comparisons and predictions.

Progress Build Level 3:

The annual pattern of repeating seasons allows climates to be compared and future weather to be predicted.

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:

Students summarize (Example from Lesson 2.3)
Hearing summaries in students' own words can help all students, especially English learners, increase their understanding of an activity. After the class discussion at the end of Activity 2, invite a student or several students to summarize the main ideas of the discussion. (Though we can't predict exact temperatures, the range gives us an idea of what the temperature might be in the near future so we can make predictions.) If many of your English learners speak the same primary language, you might invite students to summarize in that primary language.

For students needing more support:

Additional teacher modeling (Example from Lesson 3.5)
If students are having difficulty finding a second location with a climate that is different from the first location, you may wish to model your thinking aloud. Point out how when you read about Akumal in the reference book, you noticed there was not a warm or cool season, but there was a wet and a dry season. Let students know that you will try to find a climate with a warm and cool season or a climate that has warm, cool, wet, and dry seasons, which you will do by looking at the graphs for other locations. Cities with warm, cool, wet, and dry are Okinawa Island, Seattle, and Xi'an.

For students ready for a challenge:

Further investigation (Example from Lesson 1.2)
In addition to rainfall, you could have students devise methods for measuring wind speed. Have them use fans, blow dryers, or their own breath to represent different wind speeds, and measure the results with simple materials. Possible materials and methods could include (a) ribbon or string tied to the end of a pencil so the ribbon or string is blown more perpendicular to the pencil as wind speed increases, (b) a pinwheel, which spins faster as wind speed increases, or (c) a simple anemometer (which measures wind speed) made of cups, straws, and a pencil, which rotates faster as wind speed increases.

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.

Weather and Climate 3-D Coverage

SEPs
Science and Engineering Practices

DCIs
Disciplinary Core Ideas

CCCs
Cross-Cutting Concepts

Unit Level

Students learn to make weather measurements and make sense of them (scale, proportion, and quantity). They analyze a day, then a month, then a year of weather data for three fictional locations. Using the climate patterns of precipitation and temperature, students discover (patterns) how to construct evidence-based arguments about which location would be the best habitat for an orangutan reserve, with a long-term climate (despite shorter-term changes) most similar to that of Borneo (stability and change), where orangutans live.

Chapter Level

Chapter 1: Which island's weather would be best for orangutans?

Tasked with figuring out which of three islands has weather most similar to that of orangutans' habitat on Borneo, students plan and conduct investigations to measure rainfall and temperature (scale, proportion, and quantity). They then analyze quantitative data to compare Borneo's weather to the weather on three islands (patterns) as evidence in an argument about which island would be the best habitat for orangutans.

Chapter 2: Which island's weather will continue to be best for orangutans?

Students analyze and interpret a month of temperature data from the three islands and realize that weather changes day to day, so in order to identify patterns in weather (patterns), students use computational thinking to summarize data collected over a longer span of time into total monthly precipitation and monthly temperature range.

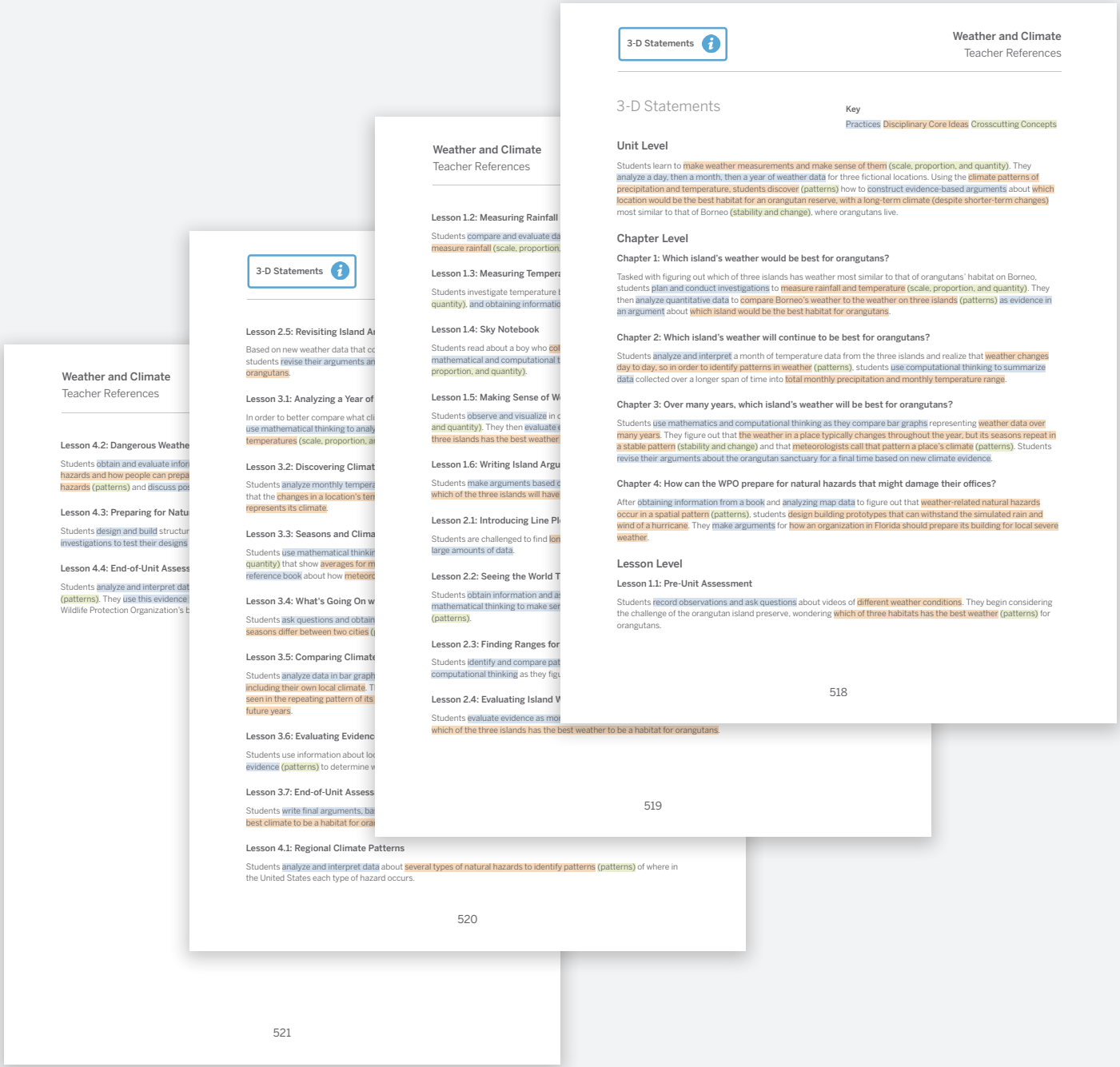
Chapter 3: Over many years, which island's weather will be best for orangutans?

Students use mathematics and computational thinking as they compare bar graphs representing weather data over many years. They figure out that the weather in a place typically changes throughout the year, but its seasons repeat in a stable pattern (stability and change) and that meteorologists call that pattern a place's climate (patterns). Students revise their arguments about the orangutan sanctuary for a final time based on new climate evidence.

Chapter 4: How can the WPO prepare for natural hazards that might damage their offices?

After obtaining information from a book and analyzing map data to figure out that weather-related natural hazards occur in a spatial pattern (patterns), students design building prototypes that can withstand the simulated rain and wind of a hurricane. They make arguments for how an organization in Florida should prepare its building for local severe weather.

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



Notes

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For more information on Amplify Science, visit **amplify.com/science/california**.

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