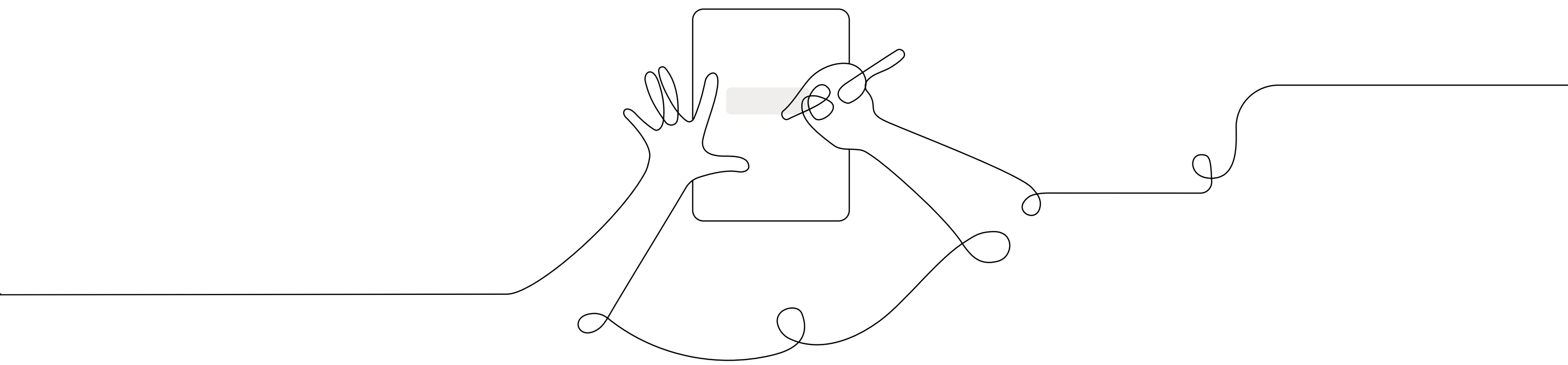
AmplifyScience

Participant Notebook

Grade 3: Weather and Climate
Unpacking for Hybrid Learning



Unit Guide resources

Once a unit is selected, select **JUMP DOWN TO UNIT GUIDE** in order to access all unit-level resources in an Amplify Science unit.

Planning for the unit

Unit Overview	Describes what's in each unit, the rationale, and how students learn across chapters
Unit Map	Provides an overview of what students figure out in each chapter, and how they figure it out
Progress Build	Explains the learning progression of ideas students figure out in the unit
Getting Ready to Teach	Provides tips for effectively preparing to teach and teaching the unit in your classroom
Materials and Preparation	Lists materials included in the unit's kit, items to be provided by the teacher, and briefly outlines preparation requirements for each lesson
Science Background	Adult-level primer on the science content students figure out in the unit
Standards at a Glance	Lists Next Generation Science Standards (NGSS) (Performance Expectations, Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts), Common Core State Standards for English Language Arts, and Common Core State Standards for Mathematics

Teacher references

Lesson Overview Compilation	Lesson Overview of each lesson in the unit, including lesson summary, activity purposes, and timing
Standards and Goals	Lists NGSS (Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts) and CCSS (English Language Arts and Mathematics) in the unit, explains how the standards are reached
3-D Statements	Describes 3-D learning across the unit, chapters, and in individual lessons
Assessment System	Describes components of the Amplify Science Assessment System, identifies each 3-D assessment opportunity in the unit
Embedded Formative Assessments	Includes full text of formative assessments in the unit
Books in This Unit	Summarizes each unit text and explains how the text supports instruction
Apps in This Unit	Outlines functionality of digital tools and how students use them (in grades 2-5)

Printable resources

Copymaster Compilation	Compilation of all copymasters for the teacher to print and copy throughout the unit
Investigation Notebook	Digital version of the Investigation Notebook, for copying and projecting
Multi-Language Glossary	Glossary of unit vocabulary in multiple languages
Print Materials (8.5" x 11")	Digital compilation of printed cards (i.e. vocabulary cards, student card sets) provided in the kit
Print Materials (11" x 17")	Digital compilation of printed Unit Question, Chapter Questions, and Key Concepts provided in the kit

Unit Map

Which island would be the best location for an orangutan reserve? How can you protect buildings from damage by weather-related natural hazards?

In their role as meteorologists, students gather evidence and analyze weather patterns so they can advise the Wildlife Protection Organization on selecting one of three islands for an orangutan reserve, the one with hot and rainy weather that is most like the orangutans' natural habitat on Borneo and Sumatra. They then look for location-based patterns in weather as they figure out if it's possible to predict and/or design solutions that can prevent damage from hurricanes and other natural hazards.

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

Students 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: Through reading and hands-on investigations, students figure out that weather measurements require consistent tools and measurement units so data can be compared. They engage in oral and written argumentation about weather data from Arc, Blue, and Creek Islands—the fictional islands proposed for the orangutan reserve.

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

Students 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: Students determine that they need a method for analyzing sets of data. As they interpret data about orangutans and read about numbers, students learn how to create and interpret line plots to find the temperature range for given locations. A digital modeling tool helps students recognize that this range represents a pattern from which they can make predictions. They analyze data to claim which island will continue to have the best weather for the orangutan reserve.

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

Students 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: Students track data related to durian fruit and discover that bar graphs allow them to analyze data over time. They analyze bar graphs of temperature and precipitation for multiple years and read about the weather in two different locations to discover that places have distinct seasonal patterns and climates. A digital modeling tool activity reinforces the idea that one year of data can reveal a seasonal pattern from which long-term predictions can be made. Students apply their understanding of seasonal patterns to argue which island will have the best weather for orangutans over the long term.

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

Students 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: By inquiring with digital tools, maps and resources in books, students discover that there are patterns in where particular weather-related natural hazards occur. They read about solutions to prevent damage from natural hazards (backup generators, sturdy roofs, storm shutters, stilts, etc.), build and test solutions that can minimize wind and water damage from hurricanes, and recommend preparatory actions that the Wildlife Protection Organization should take when they rebuild.

Progress Build

A Progress Build describes the way in which students' explanations of the central phenomenon should develop and deepen over the course of a unit. It is an important tool in understanding the design of the unit and in supporting students' learning. A Progress Build organizes the sequence of instruction, defines the focus of the assessments, and grounds inferences about students' understanding of the content, specifically at each of the Critical Juncture Assessments found throughout the unit. A Critical Juncture is the differentiated instruction designed to address specific gaps in students' understanding. This document will serve as an overview of the *Weather and Climate* Progress Build. Since the Progress Build is an increasingly complex yet integrated explanation, we represent it below by including the new ideas for each level in bold.

In the *Weather and Climate* unit, students will learn to construct scientific arguments in favor of the one island that will have weather most like the weather where wild orangutans currently live. In the process, they will determine 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.

Prior knowledge (preconceptions): It is expected that students will have a basic familiarity with weather conditions and how they are described as the unit begins. Students are also likely to have experience with seasonal changes to the weather and the understanding that weather can be different in different places. Neither idea is necessary for full participation in the unit, but having exposure to these ideas will prepare students well for what they will be learning.

Progress Build Level 1: Weather is measured in the same way to allow for comparisons.

To be able to compare the weather of one place to the weather of another place, weather data must be measured in the same way.

Progress Build Level 2: The pattern to the weather over a month allows for comparisons and predictions.

To be able to compare the weather of one place to the weather of another place, weather data must be measured in the same way. **The weather in a place varies day to day, but the temperature over a period of one month stays within a range that is particular to that location. Because of this pattern, one month of temperature data allows temperatures in different places to be compared, and one can predict a place's temperature for the upcoming several days. Temperature data for one month represents the range of daily high temperatures over the whole month. Precipitation data for one month represents the total precipitation over the whole month.**

Progress Build Level 3: The annual pattern of repeating seasons allows climates to be compared and future weather to be predicted.

To be able to compare the weather of one place to the weather of another place, weather data must be measured in the same way. The weather in a place varies day to day, but the temperature over a period of one month stays within a range that is particular to that location. Because of this pattern, one month of temperature data allows temperatures in different places to be compared, and one can predict a place's temperature for the upcoming several days. Temperature data for one month represents the range of daily high temperatures over the whole month. Precipitation data for one month represents the total precipitation over the whole month. **In a particular location, the weather varies over the course of one year, but seasons of relative warm and cold and wet and dry repeat every year. This pattern of repeating seasons allows scientists to describe and predict the weather of a place over time. It also allows them to compare the climate in one place to the climates of other places.**

Applying conceptual understanding to explain the phenomenon

Use ideas from the Progress Build and Unit Map to make notes about the conceptual and explanatory builds in your unit.

	Science concepts	Explanation of the phenomenon
	Students figure out...	*So they can explain...*
Chapter 1	Students figure out that weather measurements require consistent tools and measurement units so data can be compared.	Orangutans would like Blue Island because it had the hottest temperature and the most rain.
Chapter 2	Students determine that they need a method for analyzing sets of data. As they interpret data about orangutans and read about numbers, students learn how to create and interpret line plots to find the temperature range for given locations.	Creek Island had the most consistent amount of rain and the highest temperature range.
Chapter 3	Bar graphs allow them to analyze data over time. They analyze bar graphs of temperature and precipitation for multiple years and read about the weather in two different locations to discover that places have distinct seasonal patterns and climates.	Arc Island has a consistent seasonal pattern of warmth and rain throughout the year. Blue Island has a dry season & Creek Island has a cold season.
Chapter 4	Weather-related natural hazards can provide information to implement protective measures for buildings.	The Wildlife Protection Organization (WPO) gets solutions to prevent weather damage.

Applying conceptual understanding to explain the phenomenon

Use ideas from the Progress Build and Unit Map to make notes about the conceptual and explanatory builds in your unit.

	Science concepts	Explanation of the phenomenon
	Students figure out…	*So they can explain…*
Chapter 1		
Chapter 2		
Chapter 3		
Chapter 4		
Chapter 5		

Amplify Science@Home resources reference

Use this guide to keep track of the different resources available for remote and hybrid learning.

Instructional materials: Click Remote and hybrid learning resources, then select your grade level from the dropdown menu. Select your unit.	
@Home Unit resources: These will appear when you select your unit.	
Teacher Overview	General information for teaching with @Home Units, planning information, chapter and lesson outlines
Lesson Index	Lists the original Amplify Science lessons associated with each @Home lesson, and the Investigation Notebook pages, copymasters, and print materials associated with the @Home Unit Student Sheets
Family Overview	Information to send home to families to help them support students with remote learning
Student lesson materials for @Home Units	Printable or digital lessons condensed to be about 30 minutes long. You can access compilations of all student materials for your unit, or select from individual lessons.
@Home Video resources: After selecting your grade level and unit, select the @Home Videos tab below your unit title.	
@Home Video links	Links to video lessons that include all activities from the original units. Lesson playlists are on YouTube, and they autoplay in a playlist form.
Additional remote and hybrid instructional materials: These can be accessed from the tabs below your unit title.	
Hands-on investigations support	Videos of every unit's hands-on activities (note, these videos also appear in the student lesson materials).
Read-aloud videos	Link to a YouTube playlist of read-aloud videos of all books in your unit.
Orientation and Tutorials: Click Remote and hybrid learning resources, then select your grade from the dropdown menu. Click Orientation and Tutorials. You'll not only find videos to help you use the resources, but also videos you can share with students and caregivers.	

Suggestions for synchronous time

The following are some ideas for making the most of synchronous time with your students. As a general rule, the best way to use your synchronous time is to provide students opportunities to talk to one another, or to observe or visualize things they could not do independently.

Online synchronous time	Notes
Online discussions: It's worthwhile to establish norms and routines for online discussions in science to ensure equity of voice, turn-taking, etc. **Digital tool demonstrations:** You can share your screen and demonstrate, or invite your students to share their screen and think-aloud as they use a Simulation or other digital tool. **Interactive read-alouds**: Screen share a digital book or article, and pause to ask questions and invite discussion as you would in the classroom. **Shared Writing:** This is a great opportunity for a collaborative document that all your students can contribute to. **Co-constructed class charts:** You can create digital charts, or create physical charts in your home with student input.	

Questioning Strategies for Grades 2–5

Overview of the Role of Open-Ended Questioning

Repeated opportunities for students to listen to and speak with others are essential for promoting deep thinking and learning in science. Meaningful teacher-initiated questions create a rich context for promoting open-ended student dialogue and discussion. The *Science Framework for California Public Schools* explains that "Simply providing opportunities to talk is not enough. Effective questioning can scaffold student thinking" (*California Science Framework*, 2016, Chapter 11, p. 21). The Framework suggests that "Teacher-initiated questions are key to helping students expand their communication, reasoning, arguments, and representation of ideas in science" (*California Science Framework*, 2016, Chapter 11, p. 21). The types of questions that teachers pose are instrumental in supporting student understanding. The Framework calls for more open-ended teacher questioning that "prompts and facilitates students' discourse and thinking" and less teacher questioning that prompts "students to seek a confirmatory right answer" (*California Science Framework*, 2016, Chapter 11, p. 6).

The Amplify Science Teacher's Guide is infused with opportunities for students to discuss their developing ideas in response to open-ended prompts. Questions to promote student thinking and discussion are purposefully built into the Teacher's Guide instructional steps and Teacher Support notes that surround all our hands-on and reading activities. In addition, all units include discourse routines (e.g., Shared Listening, Think-Draw-Pair-Share, Write and Share, Word Relationships) that provide opportunities for students to use focal unit vocabulary as they think and talk with partners and the class about their understanding of key science content and practices. Many of the On-the-Fly Assessment suggestions provided throughout each unit offer open-ended follow-up questions that can be used to probe student thinking and formatively assess student understanding of the content. In addition, each unit includes multiple opportunities for students to respond to open-ended questions through additional modalities (e.g., in writing, with diagrams, through a kinesthetic model).

While the prompts embedded in each of the opportunities mentioned above provide fertile ground for student discussion, continued use of flexible, open-ended questions is invaluable for assessing students' knowledge and skills, promoting student-to-student discourse, and guiding student learning. A collection of grade-appropriate questions follows that can be used for these purposes. You will also find a list of activity types included within the Amplify Science curriculum that are particularly conducive to the use of these questions. You may choose to print out these questions and activity types for reference throughout your instruction.

Open-Ended Questions to Facilitate Student Thinking and Discourse

Questions to assess students' knowledge and skills:

- Why do you think X?
- How did you (or Could we) figure that out?
- What are you wondering?
- What questions do you have?
- Can you give an example of X?
- What is your evidence for X?
- Can you explain what (or why X) happened?

Questions to promote student-to-student discourse:

- Do you agree or disagree with (that idea)? Why?
- Can you add to what (name of student) shared?
- Do you have any questions for (student who shared)?
- Is there some evidence you can share about X?

Questions to guide student learning:

- What did you notice?
- What else do we need to figure out?
- How are X and Y similar/different?
- What does this remind you of?
- Can you explain that idea by using the vocabulary words XX and YY?
- What kind of evidence would we need to answer our question?

Activity Types Within the Amplify Science Curriculum That Are Especially Suited for Additional Teacher Questioning

The activity types listed below are student-centered and often contain prompts for pairs or small groups of students to use to discuss content or to vet evidence together. As you circulate through the classroom during these activities, you can use the open-ended questions to assess students' knowledge and skills, promote student-to-student discourse, and guide student learning.

- Hands-on activities
- Partner Reading of unit texts
- Discussion before/during/after reading unit texts
- Discussion of photographs and videos
- Discourse routines (e.g., Thought Swap, Think-Draw-Pair-Share)
- Science Practice Tool activities (modeling, sorting, graphing, diagramming, data)
- Simulation activities (grades 4–5)
- Evidence Card sorts
- Evidence Circles
- Roundtable Discussions

Multi-day planning, including planning for differentiation and evidence of student work

Day @Home Lesson 1

Minutes for science: 15 min.	**Minutes for science:** 30 min
Instructional format: ☒ Asynchronous ❑ Synchronous	**Instructional format:** ❑ Asynchronous ☒ Synchronous
Lesson or part of lesson: Introduce, student role (marine biologists)n and unit context (slides 1-13)	**Lesson or part of lesson:** Summarize the introduction to the unit. Introduce the chapter question and vocabulary and glossary resource. Have students watch the video and discuss what they observed. (Slides 14-29)
Mode of instruction: ☒ Preview ❑ Review ❑ Teach full lesson live ❑ Teach using synchronous suggestions ☒ Students work independently using: ❑ Printed @Home Slides ☒ Digital @Home Slides ❑ @Home Videos	**Mode of instruction:** ❑ Preview ❑ Review ❑ Teach full lesson live ☒ Teach using synchronous suggestions ❑ Students work independently using: ❑ Printed @Home Slides ❑ Digital @Home Slides ❑ @Home Videos

Students will...	Teacher will...	Students will...	Teacher will...
View slides and learn about the Blue Bay National Park and studying dolphin communication. Jot down initial ideas about dolphin communication.	Assign slides 1-15 in Schoology and provide direction for students to jot down their ideas about the unit problem to share when the class meets together.	Discuss their initial ideas about what meteorologists do and the tools they use. Students discuss what they viewed in the weather video.	Introduce the unit question Present slides 14-20 View the video and lead a discussion. Direct students to jot their ideas on the Explaining weather data pages that is assigned in schoology. (student sheets @Home lesson 1) Have students read the email messages (on the google sheets) and write their ideas.

Look at the *Students will* columns. What are students working in the lesson(s) that you could collect, review, or provide feedback on?
See Some Types of Written Work in Amplify Science to the right for guidance.

If there isn't a work product listed above, do you want to add one? Make notes below.

Asynchronous: students jot down their initial ideas

Synchronous: record observations of dolphin sounds.

Some Types of Written Work in Amplify Science
• Daily written reflections • Homework tasks • Investigation notebook pages • Written explanations (typically at the end of Chapter) • Diagrams • Recording pages for Sim uses, investigations, etc

How will students submit this work product to you?
See the Completing and Submitting Written Work tables to the right for guidance on how students can complete and submit work.

Asynchronous: students jot initial ideas on paper or digitally to bring with them to the asynchronous lesson

Synchronous: Students will use the student sheets to record their observations and complete the pre unit assessment and submit through Schoology.

Completing Written Work	Submitting Written Work
• Plain paper and pencil (videos include prompts for setup) • (6-8) Student platform • Investigation Notebook • Record video or audio file describing work/answering prompt • Teacher-created digital format (Google Classroom, etc)	• Take a picture with a smartphone and email or text to teacher • Through teacher-created digital format • During in-school time (hybrid model) or lunch/materials pick-up times • (6-8) Hand-in button on student platform

How will you differentiate this lesson for diverse learners? (Navigate to the lesson level on the standard Amplify Science platform and click on differentiation in the left menu.)

Supports:

- Encourage students to engage in student-to-student discussion
- Provide alternate means of expressing ideas (drawings, discussion boards, etc.)
- Provide students with the Multi-Language Glossary where appropriate, add images
- Leverage primary language for discussions
- Strategic grouping
- You may want to extend the lesson and provide more whole class time to talk about the video.

Multi-day planning, including planning for differentiation and evidence of student work

<table>
<tr><td colspan="2">Day ____________</td></tr>
<tr><td>Minutes for science: ____________

Instructional format:
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❏ Synchronous</td><td>Minutes for science: ____________

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Multi-day planning, including planning for differentiation and evidence of student work

Day ____________

Minutes for science: ____________ **Instructional format:** ❏ Asynchronous ❏ Synchronous		**Minutes for science: _____________** **Instructional format:** ❏ Asynchronous ❏ Synchronous	

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Students will…	**Teacher will…**	**Students will…**	**Teacher will…**

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Notes