AmplifyScience

Participant Notebook

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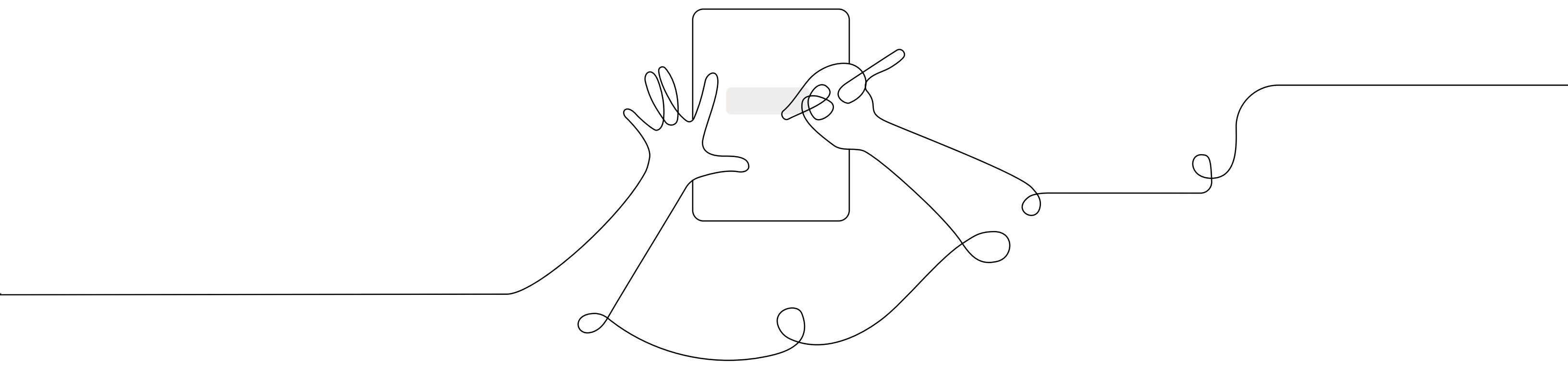

Unit Guide resources

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 NGSS Standards (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) standards 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
Articles 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 6-8)
Flextensions in This Unit	Summarizes in ormation a o t the an s On le tension lesson s in the nit

Printable resources

Coherence Flowcharts	is al representation o the stor line o the nit
Copymaster Compilation	Compilation of all copymasters for the teacher to print and copy throughout the unit
Flextension Compilation	Compilation of all copymasters for an s on le tension lessons throughout the unit
Investigation Notebook	Digital version of the Investigation Notebook, for copying and projecting
Multi-Language Glossary	nit oca lar or s in lan a es
NGSS Information for Parents and Guardians	n ormation or parents a o t the an the shi ts or teachin an learnin
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 Chapter Questions and Key Concepts provided in the kit

Unit Map

During El Niño years, why is Christchurch, New Zealand’s air temperature cooler than usual?

Students act as student climatologists helping a group of farmers near Christchurch, New Zealand figure out the cause of significantly colder air temperatures in New Zealand during the El Niño climate event. To solve the puzzle, students investigate what causes regional climates. They learn about energy from the sun and energy transfer between Earth’s surface and atmosphere, ocean currents, and prevailing winds.

Chapter 1: What determines the air temperature of Christchurch, New Zealand?

Students figure out: One thing that determines Christchurch’s air temperature is its latitude. Energy from the sun is transferred to Earth’s surface. Some of that energy is then transferred to the air above the surface. The closer a location is to the equator, the more energy it receives from the sun. Therefore, a location’s air temperature is affected by its distance from the equator. The amount of energy from the Sun does not change during El Niño years, so there must be some other cause for cooling in New Zealand.

How they figure it out: They test how energy is transferred to air, using both the Simulation and a physical experiment. They analyze map data of energy from the sun and average air temperatures. They read articles about the effects El Niño has on different locations around the world. They create models in the digital Modeling Tool showing how latitude affects New Zealand’s air temperature.

Chapter 2: Other than latitude, what else affects the air temperature of Christchurch?

Students figure out: Ocean currents also affect Christchurch’s air temperature. Water moving from the equator is warmer than the air it passes. Water moving from a pole is colder than the air it passes. Energy transfers from warmer substances to colder substances. Warmer air transfers energy to cooler currents, and warmer currents transfer energy to cooler air. In normal years, a warm current passes by New Zealand and warms its air. Something may disrupt this current during El Niño years.

How they figure it out: They analyze data from Cape Town, South Africa and Buenos Aires, Argentina, which are both at the same latitude but which have different air temperatures. They read an article about ocean currents. They test the effect of ocean currents first on ocean surface temperature and then on air temperature. They use a game-like physical model to further investigate currents and air temperature.

Chapter 3: What determines how the ocean currents near Christchurch move?

Students figure out: Prevailing winds and the position of continents determine the direction of ocean currents. Changes to prevailing winds affect ocean currents. Changes to ocean currents affect how much energy is brought to (or taken away from) a location. In El Niño years, the prevailing winds that normally drive a warm current from the Equator past New Zealand are disrupted and may stop or even reverse. This interrupts the warm current, which means less energy is transferred to New Zealand’s air.

How they figure it out: They read an article about the Gulf Stream current and how it is shaped by prevailing winds and the shape of land masses. They test how prevailing winds affect ocean currents in the Sim, and model wind and ocean currents using a physical model. They analyze data about prevailing winds and ocean temperatures to make their final visual model and written explanations about El Niño in New Zealand.

Chapter 4: Students apply what they learn to a new question—In South China during the late Carboniferous period, was the air temperature warmer or cooler than the air temperature in that location today?

Students consider a time long ago in Earth's history when land masses were in different positions. They weigh evidence about the position of continents, energy from the sun, and prevailing winds to infer ocean currents and air temperatures. They engage in oral argumentation in a student-led discourse routine called a Science Seminar and then write final arguments.

Progress Build

Each Amplify Science Middle School unit is structured around a unit-specific learning progression, which we call the Progress Build. The unit's Progress Build describes the way students' explanatory understanding of the unit's focal phenomena is likely to develop and deepen over the course of a unit. It is an important tool in understanding the structure of a unit and in supporting students' learning: it organizes the sequence of instruction (generally, each level of the Progress Build corresponds to a chapter), defines the focus of assessments, and grounds the inferences about student learning progress that guide suggested instructional adjustments and differentiation. By aligning instruction and assessment to the Progress Build (and therefore to each other), evidence about how student understanding is developing may be used during the course of the unit to support students and modify instruction in an informed way.

The *Ocean, Atmosphere, and Climate* Progress Build consists of three levels of science understanding. To support a growth model for student learning progress, each level encompasses all of the ideas of prior levels and represents an explanatory account of unit phenomena, with the sophistication of that account increasing as the levels increase. At each level, students add new ideas and integrate them into a progressively deeper understanding of how a location's latitude and the prevailing winds that push ocean currents affect a location's air temperature. Since the Progress Build reflects an increasingly complex yet integrated explanation, we represent it by including the new ideas for each level in bold.

Prior knowledge (preconceptions). Educational research and our own studies have shown that at the start of the *Ocean, Atmosphere, and Climate* unit, middle school students are likely to be familiar with the geographic position of the equator and poles. Most students will understand that, on average, locations along the equator are the warmest places on Earth while locations near the poles are the coldest, although they will have varying ideas about the cause of this pattern. Some students will be familiar with the movement of ocean currents around Earth, but they are unlikely to see these currents as a mechanism for energy transfer that influences regional climates. All students will have experienced wind as localized instances of moving air, but they are unlikely to relate them to the global pattern of prevailing winds that are strong enough to push surface ocean currents. This experience and prior knowledge can be built on and refined, which is what the *Ocean, Atmosphere, and Climate* Progress Build and unit structure are designed to do.

Progress Build Level 1: The amount of energy transferred from the sun to the surface of a location depends on the location's latitude.

Energy from the sun is transferred to Earth's surface (water and land), warming the surface. Energy transfers from the surface to the air above it. Sunlight transfers the most energy at the equator, and the amount of energy transferred gradually decreases as latitude increases. Therefore, the amount of energy in the air of a location is affected by its latitude, which determines the amount of energy transferred to that location's land and ocean water.

Progress Build Level 2: Ocean currents can affect the air temperature of a location by affecting the amount of energy in the surface of the location.

Energy from the sun is transferred to Earth's surface (water and land), warming the surface. Energy transfers from the surface to the air above it. Sunlight transfers the most energy at the equator, and the amount of energy transferred gradually decreases as latitude increases. Therefore, the amount of energy in the air of a location is affected by its latitude, which determines the amount of energy transferred to that location's land and ocean water. **Ocean water can move around an ocean basin as surface ocean currents. This can cause the surface temperature (energy) of a location to be different than expected, based on latitude. Surface currents moving from the pole toward the**

equator are cooler than the air they pass. Since these currents are cooler than the air, energy transfers from the air to the water, decreasing the temperature of the air. Surface currents moving from the equator toward a pole are warmer than the air they pass. Since these currents are warmer than the air they pass, energy transfers from water to air, increasing the temperature of the air. Energy transferred from the sun can be carried from one place to another by these currents.

Progress Build Level 3: The direction of prevailing winds and the position of the continents determine the path of ocean currents.

Energy from the sun is transferred to Earth's surface (water and land), warming the surface. Energy transfers from the surface to the air above it. Sunlight transfers the most energy at the equator, and the amount of energy transferred gradually decreases as latitude increases. Therefore, the amount of energy in the air of a location is affected by its latitude, which determines the amount of energy transferred to that location's land and ocean water. Ocean water can move around an ocean basin as surface ocean currents. This can cause the surface temperature (energy) of a location to be different than expected, based on latitude. Surface currents moving from the pole toward the equator are cooler than the air they pass. Since these currents are cooler than the air, energy transfers from the air to the water, decreasing the temperature of the air. Surface currents moving from the equator toward a pole are warmer than the air they pass. Since these currents are warmer than the air they pass, energy transfers from water to air, increasing the temperature of the air. Energy transferred from the sun can be carried from one place to another by these currents. **Surface currents are set in motion by prevailing winds, which push the currents in the direction they are blowing. When a current hits a continent, it changes direction to follow the edge of the continent. Therefore, ocean currents move in some directions without prevailing winds pushing them in that same direction.**

Guided Unit Internalization Planner

Part 1: Unit-level internalization

Unit title:

What is the phenomenon students are investigating in your unit?

Unit Question:

Student role:

By the end of the unit, students figure out …

What science ideas do students need to figure out in order to explain the phenomenon?

Unit Guide Document

Unit Map

Lesson Overview Compilation

Unit Map

Progress Buld

Guided Unit Internalization

Part 1: Unit-level internalization

Unit title: Ocean, Atmosphere, and Climate

What is the phenomenon students are investigating in your unit?
Students help a group of farmers near Christchurch, New Zealand figure out the cause of significantly colder air temperatures in New Zealand during the El Niño climate event.

Unit Question:	**Student role:**
What determines the air temperature of a location Earth?	Student climatologists

By the end of the unit, students figure out ...
Location and ocean currents affect Christchurch's air temperature. The closer a location is to the equator, the more energy it receives from the sun. Also, water moving from the equator is warmer than the air it passes, and the warmer currents transfer energy to cooler air. n normal years, a warm current passes by New Zealand and warms its air. Changes to the prevailing winds affect ocean currents, which affect how much energy is brought to (or taken away from) a location. In El Niño years, the prevailing winds that normally drive a warm current from the Equator past New Zealand are disrupted and may stop or even reverse., which means less energy is transferred to the air.

What science ideas do students need to figure out in order to explain the phenomenon?
The amount of energy in the air of a location is affected by its latitude, which determines the amount of energy transferred to that location's land and ocean water. Ocean water can move around an ocean basin as surface ocean currents. This can cause the surface temperature (energy) of a location to be different than expected, based on latitude. Surface currents moving from the equator toward a pole are warmer than the air they pass. Since these currents are warmer than the air they pass, energy transfers from water to air, increasing the temperature of the air. Surface currents are set in motion by prevailing winds, which push the currents in the direction they are blowing. The direction of prevailing winds and the position of the continents determine the path of ocean currents.

Ocean, Atmosphere, and Climate @Home Lesson Index

The Amplify Science@Home Units are versions of Amplify Science units adapted for use in a remote learning or hybrid learning situation. To help you plan instruction, below we have listed the @Home Lessons alongside the Amplify Science unit's Lesson(s) from which they come.

Index: @Home Unit Lessons and corresponding *Ocean, Atmosphere, and Climate* Lessons

@Home Lesson	Adapted from Amplify Science *Ocean, Atmosphere, and Climate*
@Home Lesson 1	Lesson 1.2
@Home Lesson 2	Lessons 1.3
@Home Lesson 3	Lessons 1.4 and 1.5
@Home Lesson 4	Lesson 1.5 and 2.1
@Home Lesson 5	Lesson 2.2
@Home Lesson 6	Lesson 2.3
@Home Lesson 7	Lesson 2.4
@Home Lesson 8	Lesson 3.1
@Home Lesson 9	Lesson 3.2
@Home Lesson 10	Lesson 3.3
@Home Lesson 11	Lessons 3.4
@Home Lesson 12	Lessons 4.1
@Home Lesson 13	Lesson 4.2 and 4.3
@Home Lesson 14	Lesson 4.4

The student sheets and packets used in @Home Units are original or modified versions of the unit's Amplify Science Investigation Notebook pages or copymasters. When necessary, new pages were also created. In the following table we have outlined the @Home Student Sheet and Packet page titles and their origins.

Index: @Home Student Sheets/Packets and corresponding *Ocean, Atmosphere, and Climate* materials

@Home Lesson	Student Sheet/Packet page title	Investigation Notebook page, copymaster, or print material	Possible Responses
1	Exploring Temperature and Energy in the Sim	Modified, based on Pg. 8	Lesson 1.2, Activity 3, Card 2, Possible Responses
1	*Ocean, Atmosphere, and Climate* Glossary	Lesson 1.2 Digital Resource	N/A
2	Gathering Evidence with the Sim	Modified, based on P. 14–15	Lesson 1.3, Activity 3, Possible Responses
2	Revisiting the Claims with New Evidence	Pg. 16 and 17	Lesson 1.3, Activity 4, Card 2, Possible Responses
3	Investigating Air Temperatures at Different Locations	Modified, based on Pg. 21	Lesson 1.4, Activity 2, Card 3, Possible Responses
3	Modeling What Determines a Location's Air Temperature	Modified, based on Pg. 23	N/A
3	Modeling Tool: Modeling What Determines a Location's Air Temperature	New	Lesson 1.4, Activity 3, Possible Responses
3	Chapter 1 @Home Science Wall	New, based on Classroom Wall materials	N/A
4	Article: "The Ocean in Motion"	Lesson 2.1 Digital Resources	N/A
5	Rereading "The Ocean in Motion"	New	N/A
5	Investigating Ocean Surface Temperature: Part 1	Pg. 43	Lesson 2.2, Activity 3, Card 1, Possible Responses
5	Investigating Ocean Surface Temperature: Part 2	Pg. 44 and 45	Lesson 2.2, Activity 3, Card 2, Possible Responses
6	Water and Air Temperature Experiment	Modified, based on Pg. 50	Lesson 2.3, Activity 2, Possible

			Responses
6	Investigating Ocean Currents and Air Temperature	New	N/A
6	Air Temperature in Buenos Aires and Cape Town	Pg. 53	Lesson 2.3, Activity 4, Possible Responses
7	Modeling How Currents Affect Air Temperature	Modified, based on Pg. 60	N/A
7	Paper Modeling Tool	New	Lesson 2.4, Activity 2, Card 2, Possible Responses
7	Writing a Report to the New Zealand Farm Council	Modified, based on Pg. 62	N/A
7	Chapter 2 @Home Science Wall	New, based on Classroom Wall materials	N/A
8	Article: “The Gulf Stream”	Lesson 3.1 Digital Resources	N/A
9	Rereading “The Gulf Stream: A Current That Helped Win a War”	Pg. 87	Lesson 3.2, Activity 2, Possible Responses
9	Investigating with the Currents Tank	Modified, based on Pg. 89 and 90	N/A
10	Modeling Ocean Currents Near Christchurch	Modified, based on Pg. 96	Lesson 3.3, Activity 2, Possible Responses
10	Investigating the Effect of Changing Winds	Modified, based on Pg. 97, 98, and 99	Lesson 3.3, Activity 3, Possible Responses
11	Write and Share Routine: Partner 1 and Partner 2	Pg. 103 and 104	Lesson 3.4, Activity 2, Possible Responses
11	Evidence Cards	Lesson 3.4 Digital Resources	N/A
11	Writing a Scientific Argument	Modified, based on Pg. 108	N/A
11	Chapter 3 @Home Science Wall	New, based on Classroom Wall materials	N/A
12	Science Seminar Reference and Evidence Cards	Lesson 4.1 Digital Resources	N/A
12	Annotating and Discussing Evidence	Pg. 117	N/A
12	Science Seminar Claims	Lesson 4.1 Digital	N/A

		Resources	
12	Sorting the Evidence Cards	Pg. 118	N/A
13	Argumentation Sentence Starters	Print materials 8.5 x 11	N/A
13	Writing Scientific Arguments	Modified, based on Pg. 128, 129, and 130	Lesson 4.3, Activity 4, Possible Responses
14	Written-Response Question #1	Lesson 4.4 Digital Resources End-of-Unit Assessment copymaster	Lesson 4.4, Activity 2, Possible Responses
14	Written-Response Question #2	Lesson 4.4 Digital Resources End-of-Unit Assessment copymaster	Lesson 4.4, Activity 3, Possible Responses

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

Day ____________

Minutes for science: ____________	**Minutes for science:** _____________
Instructional format: ❏ Asynchronous ❏ Synchronous	**Instructional format:** ❏ Asynchronous ❏ Synchronous
Lesson or part of lesson:	**Lesson or part of lesson:**

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…**

<table>
<tr>
<td rowspan="2">Look at the Students will columns. What are students working in the lesson(s) above 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.</td>
<td colspan="2">Some Types of Written Work in Amplify Science</td>
</tr>
<tr>
<td colspan="2">● Daily written reflections
● (6-8) Homework tasks
● (K-5) Investigation notebook pages
● Written explanations (typically at the end of Chapter)
● Diagrams
● Recording pages for Sim uses, investigations, etc</td>
</tr>
<tr>
<td rowspan="2">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.</td>
<td>Completing Written Work</td>
<td>Submitting Written Work</td>
</tr>
<tr>
<td>● 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)</td>
<td>● 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</td>
</tr>
<tr>
<td colspan="3">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.)</td>
</tr>
</table>

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	

Lesson or part of lesson:
 	
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
		Lesson or part of lesson:
		
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		❏ Preview
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		  ❏ Printed @Home Slides
		  ❏ Digital @Home Slides
		  ❏ @Home Videos	

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

Look at the *Students will* columns. What are students working in the lesson(s) above 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.	**Some Types of Written Work in Amplify Science** ● Daily written reflections ● (6-8) Homework tasks ● (K-5) 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.	**Completing 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)	**Submitting Written Work** ● 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.)

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.	

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.	

Notes