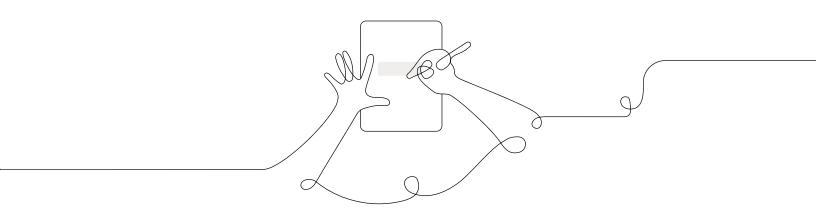
## **Amplify**Science

# Participant Notebook

Grade 5: Ecosystem Restoration 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.

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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

## Why aren't the jaguars and sloths in a reforested part of the Costa Rican rain forest ecosystem growing and thriving?

Working as ecologists, students figure out why the organisms in a part of a Costa Rican rain forest ecosystem aren't growing and thriving. As they solve this problem, students learn more generally how organisms in an ecosystem get the matter and energy they need to survive. Along the way, students write a series of restoration plans that include arguments about why the rain forest ecosystem is not thriving and recommend actions to restore its health.

#### Chapter 1: Why aren't the jaguars and sloths growing and thriving?

**Students figure out:** Jaguars eat the body matter of sloths as food so they can grow. They change the food molecules from the sloth into molecules that build their body matter or release energy for movement and growth. The sloths eat the body matter of cecropia trees as food so they can grow. They change the food molecules from the cecropia trees into molecules that build their body matter or release energy for movement and growth. Because there weren't enough cecropia trees in the failing rain forest ecosystem, the sloths and jaguars did not have enough food.

How they figure it out: Students learn that everything in an ecosystem is made of matter. They use the *Ecosystem Restoration* Simulation as well as physical models to show how animals get the food molecules they need to grow their bodies. They analyze data about the animals and plants in the project area and use the data to write an argument about why the animals are not growing and thriving. They also make recommendations for improving the health of this area of the rain forest.

#### Chapter 2: Why aren't the cecropia trees growing and thriving?

**Students figure out:** Cecropia trees in the rain forest ecosystem make their own food. Like all plants, they use energy from the sun to turn carbon dioxide and water into food molecules. They change these food molecules into molecules that build their bodies or release energy. The cecropia trees must not be getting the sunlight, water molecules, or air molecules that they need to grow and thrive.

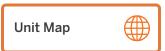
How they figure it out: Students use and create models to investigate how plants get food and how energy enters and flows through the ecosystem. They read about the role of energy and conduct investigations in the Simulation in order to figure out that all energy in an ecosystem can eventually be traced back to the sun. They demonstrate their understanding by making a model of the relationships between the sun, plants, and animals in an ecosystem. Students write a data-based argument about why the cecropia trees are not growing and thriving and include new recommendations for improving the health of this area of the rain forest.

#### Chapter 3: Why aren't the cecropia trees growing and thriving in the soil?

**Students figure out:** Decomposers live in the soil in the rain forest ecosystem and use matter from dead organisms as food. Decomposers change the food molecules into molecules that build their own body matter or release energy for movement and growth, and decomposers also release nutrients into the soil. Nutrients in the soil are important for cecropia trees because they help the plants make food and body matter. Because there are not enough decomposers in the soil, there are not enough nutrients. This is the reason the cecropia trees are not growing and thriving, which affects the health of the whole ecosystem.

### **Ecosystem Restoration**





How they figure it out: Students gather data from the Simulation, hands-on investigations with soil, and a close-up look at soil and decomposition in a forest ecosystem in *Walk in the Woods*. They figure out that the soil in the project area lacks decomposers. Students use data about the decomposers and the soil in the project area to write their final Restoration Plan, an argument about why the cecropia trees are not growing and thriving in the soil.

### **Ecosystem Restoration**

Planning for the Unit

### 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 Assessment guides the instruction designed to address specific gaps in students' understanding. This overview document will serve as an overview of the *Ecosystem Restoration* 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 *Ecosystem Restoration* unit, students will learn to construct scientific arguments that support claims about how the flow of matter in an ecosystem can help ecologists understand why the organisms in a rain forest restoration project area are not growing and thriving.

**Prior knowledge (preconceptions):** Students are expected to understand that some animals eat plants for food, and some eat other animals for food. Students are also likely to understand that plants need water and energy from the sun. Students may have learned that matter is made up of particles that are too small to see individually. However, it is not expected that students have considered matter in the context of an ecosystem or food web. While these ideas are not necessary for students to participate fully in the unit, having exposure to these ideas will prepare students well for what they will be learning.

## Progress Build Level 1: The food matter that animals need to grow and use for energy can always be traced back to plants.

Organisms in an ecosystem are made of matter. Matter is made up of small parts called molecules. When organisms add new molecules to their bodies, they grow. Organisms get new molecules from eating. Animals eat the body matter of plants and other animals as food. Animals change those food molecules into molecules that build their body matter or release energy for movement and growth. The matter that makes up organisms travels from organism to organism as animals eat. Food molecules can always be traced back to plants in an ecosystem.

## Progress Build Level 2: Energy from the sun is brought into an ecosystem when plants make food by using water molecules, carbon dioxide from the air, and energy from the sun.

Organisms in an ecosystem are made of matter. Matter is made up of small parts called molecules. When organisms add new molecules to their bodies, they grow. Organisms get new molecules from eating. Animals eat the body matter of plants and other animals as food. Animals change those food molecules into molecules that build their body matter or release energy for movement and growth. **Energy, including the energy that animals get from breaking down food matter, is not matter.** The matter that makes up organisms **and energy** travels from organism to organism as animals eat. Food molecules can always be traced back to plants in an ecosystem, **and energy can always be traced back to the sun.** 

Unlike animals, plants do not eat other organisms; plants make their own food. Plants use energy from the sun to turn carbon dioxide molecules from the air and water molecules from soil into new food molecules for their bodies. (Sunlight is a form of energy, not matter; air and water molecules are matter.) Plants then change those food molecules into molecules that build their bodies or release energy.



## Progress Build Level 3: Decomposers consume dead matter and release nutrients that plants use to help them make food molecules.

Organisms in an ecosystem are made of matter. Matter is made up of small parts called molecules. When organisms add new molecules to their bodies, they grow. Organisms get new molecules from eating. Animals eat the body matter of plants and other animals as food. Animals change those food molecules into molecules that build their body matter or release energy for movement and growth. Energy, including the energy that animals get from breaking down food matter, is not matter. The matter that makes up organisms and energy travels from organism to organism as animals eat. Food molecules can always be traced back to plants in an ecosystem, and energy can always be traced back to the sun.

Unlike animals, plants do not eat other organisms; plants make their own food. Plants use energy from the sun to turn carbon dioxide molecules from the air and water molecules from soil into new food molecules for their bodies. (Sunlight is a form of energy, not matter; air and water molecules are matter.) Plants then change those food molecules into molecules that build their bodies or release energy.

Food for decomposers is dead animal and plant body matter. Decomposers change those food molecules into molecules that build their body matter or release energy for movement and growth. Decomposers also release nutrients from dead plant and animal matter into the soil. Plants use those nutrients to make more food and body matter. (Decomposers, soil, and nutrients are made of matter.)

### 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.

ĺ	Science concepts	Explanation of the phenomenon	
2.9	Students figure out	So they can explain	
Chapter 1	Everything is made of matter. Matter is made of molecules. Animals grow by changing food molecules into body molecules that can build their bodies. Animals use some food molecules to release energy for movement and growth. Food molecules in an ecosystem can always be tracked back to pants.	Jaguars eat the body matter of sloths and sloths eat the body matter of cecropia trees as food. They change the food molecules into molecules that build their body matter or release energy for movement and growth. Since there weren't enough cecropia trees in the failing rain forest ecosystem, neither animal had enough food.	
Chapter 2	Plants use water molecules, carbon dioxide molecules from the air, and energy from the sun to make food. Energy in an ecosystem can always be traced back to the sun. Scientists convince others that their claims are correct by using data and ideas as evidence.	Cecropia trees in the rain forest ecosystem make their own food. Like all plants, they use energy from the sun to turn carbon dioxide and water into food molecules. They change these food molecules into molecules that build their bodies or release energy. The cecropia trees must not be getting what they need to grow and thrive.	
Chapter 3 Chapter 4	Decomposers release nutrients from dead plants and animals into the soil. Animals, plants, and decomposers grow by changing food molecules into body molecules that can build their bodies. Animals, plants, and decomposers use some food molecules to release energy for movement and growth. Plants need nutrients to help make food molecules for energy and body matter.	Decomposers live in the soil in the rain forest ecosystem and use matter from dead organisms as food. Decomposers change the food molecules into molecules that build their own body matter or release energy for movement and growth.  Decomposers also release nutrients into the soil, which are important for cecropia trees because they help them make food and body matter. Since there are not enough decomposers in the soil, there are not enough nutrients for the trees.	
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## 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 resource These will appear who	es: en 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.			
<ul><li>@Home Video resources:</li><li>After selecting your grade level and unit, select the @Home Videos tab below your unit title.</li></ul>				
@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	Read-aloud videos Link to a YouTube playlist of read-aloud videos of all books in your unit.			
Orientation and Tutorials:				

can share with students and caregivers.

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

## 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 openended 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

Day@Home Lesson 1				
Minutes for science: 30 min.		Minutes for science: 30 min	<del>_</del>	
Instructional format:  Asynchronous Synchronous		Instructional format: A Asynchronous Synchronous	Asynchronous	
Lesson or part of lesson: (slides 1-16) Talk & Introducing the Unit		Lesson or part of lesson: (Slides 16-18) Pre-Unit Assessment		
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		
Discuss their initial ideas as the teacher walks them through slides 1-11. Understand the unit question and their role as ecologists. Listen to the directions for the pre-unit assessments.	Teacher will  Walk students through slides 1-11 giving students opportunities to share their ideas. Introduce the unit question and the word, ecologist. Then set students up to complete the pre-unit assessment during asynchronous time.	Students will Complete the Pre-Unit Assessment.	Teacher will Assign the Pre-Unit Assessment.	

Amplify.

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.

Synchronous: students jot down their initial ideas before sharing out

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 complete the written pre-unit

<u>Synchronous</u>: students can jot ideas on a Jamboard, Google Doc or scrap paper

Asynchronous: Students will use the student sheets to complete their assessment. I can use Cami to make the sheets fillable and assign through Schoology so that students can complete digitally and submit back to me.

### Completing Written Work | Submitting Written Work

- Plain paper and pencil (videos include prompts for setup)
  - (6-8) Student platformInvestigation 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
- Inrough 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:

assessment

- Encourage students to engage in student-to-student discussion
- 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 different ecosystems.
- Expand on the introduction of the word organism by having students write/draw/diagram to describe an organism they are familiar with. This is something they can come back to throughout the unit as their knowledge grows.

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

Day					
Minutes for science:		Minutes for science:	<u> </u>		
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		

Look at the Students will columns. What are students working in the lesson(s)	Some Types of Written \	Some Types of Written Work in Amplify Science	
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.	<ul> <li>Daily written reflections</li> <li>(6-8) Homework tasks</li> <li>(K-5) Investigation notebook pages</li> <li>Written explanations (typically at the end of Chapter)</li> <li>Diagrams</li> <li>Recording pages for Sim uses, investigations, etc</li> </ul>		
How will students submit this work product to you?	Completing Written Work	Submitting Written Work	
See the Completing and Submitting Written Work tables to the right for guidance on how students can complete and submit work.	<ul> <li>Plain paper and pencil (videos include prompts for setup)</li> <li>(6-8) Student platform</li> <li>Investigation Notebook</li> <li>Record video or audio file describing work/answering prompt</li> <li>Teacher-created digital format (Google Classroom, etc)</li> </ul>	<ul> <li>Take a picture with a smartphone and email or text to teacher</li> <li>Through teacher-created digital format</li> <li>During in-school time (hybrid model) or lunch/materials pick-up times</li> <li>(6-8) Hand-in button on student platform</li> </ul>	

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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		

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