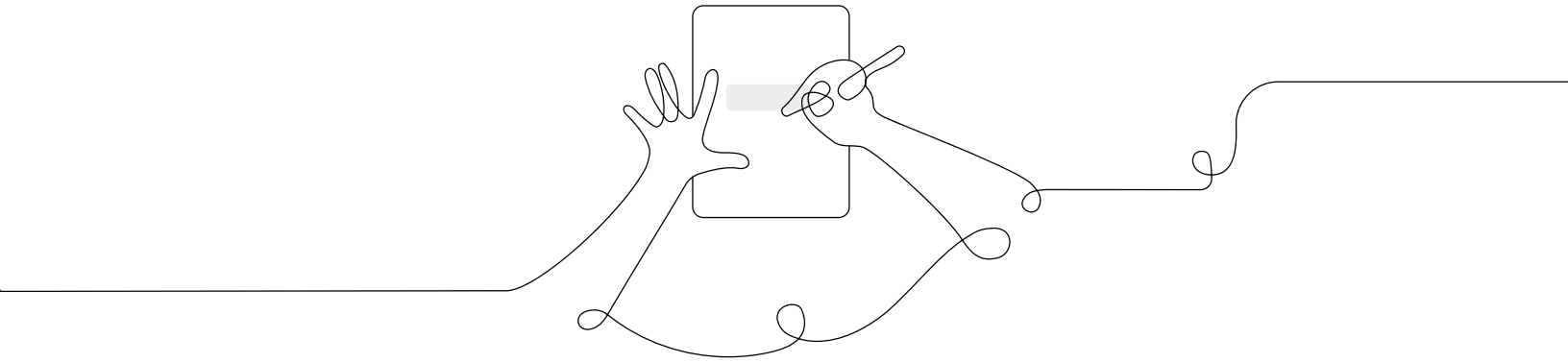
AmplifyScience

Participant Notebook

Grade 2: Changing Landforms
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

Why is the edge of the ocean cliff closer to the flagpole than it used to be?

The director of the Oceanside Recreation Center got a scare when a nearby cliff collapsed, and he is worried that erosion on the recreation center's ocean cliff might have safety implications for the center's visitors. By taking on the role of geologists investigating landforms and erosion, students are able to advise the director on the prudence of keeping the center open, even though its cliff is also changing.

Chapter 1: How did the edge of the cliff get to be so close to the flagpole?

Students figure out: The shape of the cliff changed when the rock it is made of changed.

How they figure it out: Students read about and observe photos of different types of landforms as they gather evidence that landforms are made of rock. They investigate sand samples and see that sand is composed of tiny pieces of rock. They read a book about a scientist who makes inferences about the rock that the sand originated from based on its size, shape, and color. The class then visualizes how grains of sand can form and how landforms can change size and shape using a model where they shake pieces of hard candy. Students write a scientific explanation of how the shape of the cliff can change.

Chapter 2: How did the recreation center's cliff change?

Students figure out: Water hit the cliff and caused tiny pieces of the cliff to break off and move away.

How they figure it out: Students investigate the process by which landforms change. They observe images of landforms before and after big changes and discuss ideas about what might have caused the change to each landform. They identify water as an agent of change and use models with chalk to investigate how water can change a landform. They read how water—in both liquid and solid form—can erode landforms by causing pieces of rock to break off. Students diagram this process and conclude the chapter by writing an explanation of how landforms change.

Chapter 3: How did the recreation center's cliff erode without the director noticing?

Students figure out: Because the pieces are so small, it took a really long time to observe a big change to the cliff.

How they figure it out: Students are introduced to maps as a tool for geologists studying changes to landforms. Using the reference book, students discuss features of maps and explore landforms from different perspectives. They use a digital modeling tool to create their own maps of landforms. Using a model made of pom-poms that represents a mountain, students erode the model to show how many small changes (difficult to notice) can add up to a bigger change (easy to notice). Students also consider the scale of time and conclude that perceptible changes to landforms usually take a very long time. Finally, students write explanations and create diagrams that explain how the recreation center's cliff eroded without the director noticing.

Chapter 4: Could the recreation center's cliff erode quickly?

Students figure out: The nearby cliff eroded quickly because it is made of loose materials, such as clay and dirt, which are not as strong as rock. When wind or water hits the cliff, big pieces can break off. This causes the cliff to change more quickly than rock would.

How they figure it out: Students brainstorm and create diagrams of ways they think landforms can erode quickly. Using the reference book, they learn that landforms with cracks and landforms made of loose materials can erode faster than landforms made of solid rock. They use multiple erosion models to provide evidence that supports the idea that wind and water can quickly erode landforms made of loose materials. After reflecting on the many models and information sources from the unit, students use the digital modeling tool to demonstrate their understanding of why landforms made of different materials erode at different rates. Students use newly discovered evidence and key ideas to diagram and write a final explanation of why the nearby cliff eroded overnight. The class then discusses how they should advise the director about the safety of the recreation center's cliff.

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 *Changing Landforms* 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 *Changing Landforms* unit, students will learn to construct scientific explanations about how a cliff near the ocean could have changed, and to consider the timescale of the changes. While not explicitly included in the Progress Build, students will expand upon these ideas in the final chapter by investigating how landforms can change quickly.

Prior knowledge (preconceptions): At the start of this unit, students are expected to have had some experiences with rock and understand that rock is hard and can be different sizes and shapes. Students are not expected to understand that large-scale features of Earth, such as cliffs and mountains, are made of rock. Students are expected to be familiar with the idea that Earth's surface is made of both water and land, and that land can have varying shapes and topography (e.g., mountains, coastlines, etc.).

Progress Build Level 1: Landforms can change.

Landforms are made of rock and rock can change; therefore landforms can change.

Progress Build Level 2: Water can cause landforms to change.

Landforms are made of rock and rock can change; therefore landforms can change. **When water hits a landform, it causes small pieces of the landform to break off.**

Progress Build Level 3: Landforms change slowly.

Landforms are made of rock and rock can change; therefore landforms can change. When water hits a landform, it causes small pieces of the landform to break off. **We can't see the landform change in front of us. It takes a long time for the landform to change shape because the pieces that break off are so small. When enough tiny pieces of the landform break off, the landform changes enough that we can observe the change.**

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 gather evidence to prove that landforms are made of rock. They figure out that landforms can change shape, size and color.	The shape of the cliff changed when the rock it is made of changed.
Chapter 2	Students investigate the process by which landforms change. Water is an agent of change in both liquid and solid form. It causes pieces of rock to fall away.	The recreation center's cliff changed when pieces of the cliff broke off and fell away.
Chapter 3	Student geologist use maps as a tool to study changes in landforms. Students also consider the scale of time and conclude that perceptible changes to landforms usually take a very long time.	The director did not notice the cliff erode because the pieces were so small and it took time for the change to be noticed.
Chapter 4	Students learn that landforms with cracks and landforms made of loose materials can erode faster than landforms made of solid rock.	The nearby cliff eroded quickly because it was made of loose materials like clay and dirt. The center's cliff is made of rock.

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: 30 min. **Instructional format:** ❑ Asynchronous X Synchronous	**Minutes for science:** 20 min **Instructional format:** X ❑ Asynchronous ❑ Synchronous
Lesson or part of lesson: Introduce, student role (geologist) and unit context (slides 1-15) **Mode of instruction:** ❑ Preview ❑ Review X 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:** Students will watch the @Home video read aloud of Landform Postcards **Mode of instruction:** ❑ Preview ❑ Review ❑ Teach full lesson live ❑ Teach using synchronous suggestions X ❑ Students work independently using: ❑ Printed @Home Slides X ❑ Digital @Home Slides ❑ @Home Videos

Students will...	Teacher will...	Students will...	Teacher will...
View slides and learn about the unit problem and their role as geologists. Students will do the pre writing assessment about landform arches.	Introduce the unit question and chapter question. Walk students through slides and assign google sheets for lesson 1 through schoology.	Students will view video of Landform postcards. (Read aloud video) Students will answer the 2 questions posed by the teacher.	Assign read aloud video of Landform Postcards to students in schoology. Assign students in schoology to answer these questions: Do you recognize any of these landforms? Have you visited or seen pictures of any of them?

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
- Visual representations
- Clarify multiple meaning words in reading

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

<table>
<tr><td colspan="4">Day _____</td></tr>
<tr><td colspan="2">Minutes for science: _____

Instructional format:
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