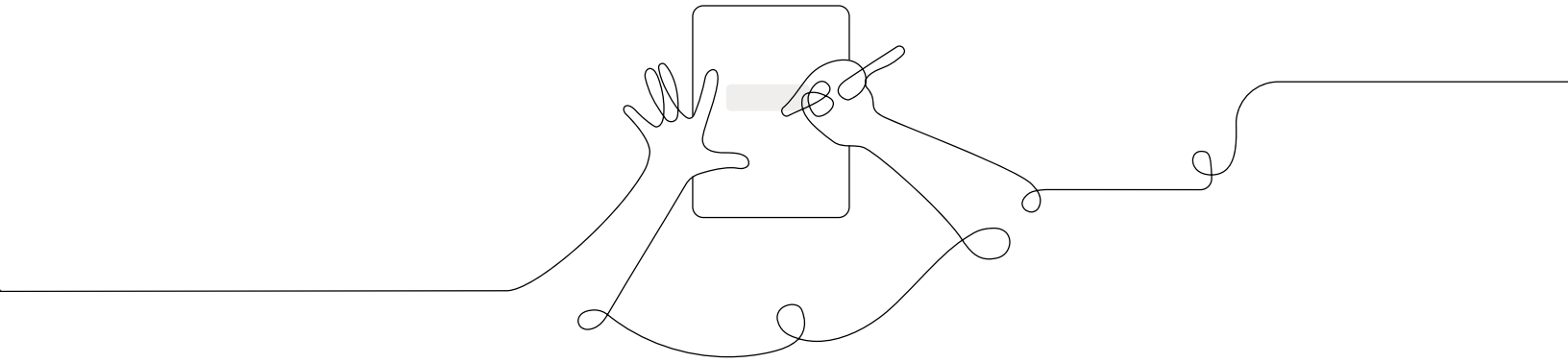
AmplifyScience

Participant Notebook

Grade 5: Patterns of Earth and Sky
Unit 1 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

Archaeologists discovered part of an ancient artifact that depicts the sun and other stars. How can we figure out what would have appeared on the missing piece?

Taking on the role of astronomers, students help a team of archaeologists at the fictional Museum of Archaeology figure out what the missing piece of a recently discovered artifact might have depicted. As they learn about the sun and other stars and the movement of Earth, students can explain what is shown on the artifact and what might be on the missing piece.

Chapter 1: Why don't we see a lot of stars in the daytime?

Students figure out: The stars are all around Earth in every direction. Because the sun is much closer to Earth than all other stars, it appears bigger and brighter. During daytime, the sun's brightness overwhelms the brightness of other stars, and that is why we can only see the sun during the daytime. This is why the artifact depicts the sky in different scenes: the sun in the sky is distinct from depictions showing all other stars in the sky.

How they figure it out: Through reading and investigating in the *Patterns of Earth and Sky* Simulation, students gather data about the size and distance of objects in space relative to Earth. Students create a physical model demonstrating the distances of various stars and the sun from Earth and conclude that it is the immense distance of Earth from other stars and the sun's proximity to Earth that creates the illusion of other stars being much smaller than the sun. By gathering additional evidence in text and photos and a video, students come to understand why they can't see other stars in the daytime.

Chapter 2: Why is the sun up sometimes, but not other times?

Students figure out: The sun is only up sometimes and not at other times because Earth spins once per day. Since gravity pulls us down toward Earth, we are carried with Earth as it spins. What we see up above us changes as we spin. When the side of Earth we are on faces the sun, the sun is up in the sky. When Earth spins to face away from the sun, the sun is not up, and we can see other stars. This is why each artifact panel shows a repeating pattern: the sun is in the sky, then other stars are in the sky, and so on.

How they figure it out: Through a series of observations in the Simulation, participation in a kinesthetic model, and video evidence, students investigate what causes the daily pattern of sun and stars that can be seen from Earth. Students read and model to investigate Earth's gravitational pull and conclude which way is *up*.

Chapter 3: Why do we see different stars at different times of year?

Students figure out: As Earth spins, it also orbits around the sun once a year. Since Earth is moving, this means that throughout the year, Earth is in different places in its path around the sun. Our view of the stars in the nighttime sky changes in a pattern that repeats each year because Earth is traveling along its orbital path. This is why the artifact shows different constellations in the different nighttime panels.

How they figure it out: Using the Simulation and a kinesthetic classroom model, students investigate what constellations can be seen over the course of a year and across multiple years. They carefully plan a systematic investigation with the Simulation and look for patterns in the data. Students read about Earth's orbit around the sun and apply their new ideas to the classroom model in order to understand the yearly pattern of star visibility.

Chapter 4: How can we investigate why we see different stars on different nights?

Students figure out: We can investigate many different questions about the stars using systematic observations.

How they figure it out: Students are presented with a list of possible questions about patterns of when and where certain constellations can be seen. Students choose a question to investigate and apply what they have learned to carefully plan their own investigations in the Simulation. Through peer feedback and iteration, students refine their investigation plans. They then conduct their investigations in the Simulation and share results with peers.

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 document will serve as an overview of the *Patterns of Earth and Sky* 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 *Patterns of Earth and Sky* unit, students will learn to construct scientific explanations about why we see different stars at different times.

Prior knowledge (preconceptions): By grade 5, students will have had many everyday experiences looking up at the sky. They are likely to know the sun is up during the daytime and stars are up during the nighttime. Students may understand that Earth is round and that Earth moves, although they may not know that Earth moves in two different ways simultaneously (spin and orbit). Students may have been exposed to the concept of gravity and that it makes things fall down to the ground. 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 sun looks bigger and brighter than all other stars because it is much closer to Earth than all other stars.

We see the sun and not the other stars during the daytime, even though stars are all around Earth. This is because the sun is the closest star to Earth. Because the sun is so much closer to Earth than all other stars, the sun appears to be much bigger and brighter than all other stars. When the sun is up during the daytime, it looks so bright that it makes it difficult for us to see the other stars.

Progress Build Level 2: As Earth spins, what we see in the sky changes throughout the day.

We see the sun and not the other stars during the daytime, even though stars are all around Earth. This is because the sun is the closest star to Earth. Because the sun is so much closer to Earth than all other stars, the sun appears to be much bigger and brighter than all other stars. When the sun is up during the daytime, it looks so bright that it makes it difficult for us to see the other stars. **The sun appears sometimes, but not at other times, because Earth spins once each day (24 hours) while other stars, including the sun, remain in place. Since Earth always pulls things down toward the ground with gravitational force, what we see up in the sky changes as Earth spins. When the side of Earth we are on faces the sun, the sun is in the sky. When Earth spins to face away from the sun, the sun is not in the sky, so we can see other stars.**

Progress Build Level 3: As Earth orbits the sun, the stars we see in the night sky change throughout the year.

We see the sun and not the other stars during the daytime, even though stars are all around Earth. This is because the sun is the closest star to Earth. Because the sun is so much closer to Earth than all other stars, the sun appears to be much bigger and brighter than all other stars. When the sun is up during the daytime, it looks so bright that it makes it difficult for us to see the other stars. The sun appears sometimes, but not at other times, because Earth spins once each day (24 hours) while other stars, including the sun, remain in place. Since Earth always pulls things down toward

the ground with gravitational force, what we see up in the sky changes as Earth spins. When the side of Earth we are on faces the sun, the sun is in the sky. When Earth spins to face away from the sun, the sun is not in the sky, so we can see other stars. **At the same time as Earth spins, it orbits the sun once a year. This means that Earth's position in space around the sun changes throughout the year, so when Earth faces away from the sun at different times of year, it is facing different directions and different stars. Therefore, we see different stars in the night sky throughout the year as Earth completes its orbit around the sun.**

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	The stars all all around Earth in every direction. Because the sun is closer to Earth than other stars, it appears bigger and brighter. The sun's light overwhelms the brightness of other stars.	The artifact depicts the sky in different scenes, the sun in the sky is distinct from depictions showing all other stars in the sky.
Chapter 2	The sun shows only when the earth has rotated and is facing the sun. When the earth rotates away from the sun, we are able to see other stars.	Each artifact panel shows a repeating pattern: the sun is in the sky, then other strs are in the sky, etc.
Chapter 3	As Earth spins, it orbits around the sun once a year. This changes the view of the stars in the nighttime sky..	The artifact shows different constellations in the different nighttime panels.
Chapter 4	Students learn that scientists face challenges, and that conducting an investigation is not always a linear process—investigations require revisions and perseverance, and seeing a pattern can be a first step toward finding an answer.	Students independently plan, conduct, and revise their own investigations of star patterns

Applying conceptual understanding to explain the phenomenon

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	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 ☒ Synchronous	**Minutes for science:** 30 min **Instructional format:** ☒ Asynchronous ❑ Synchronous
Lesson or part of lesson: (slides 1-15) Talk & Introducing the Unit **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:** (slides 13-15) 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

Students will...	**Teacher will...**	**Students will...**	**Teacher will...**
Discuss their initial ideas as the teacher walks them through slides 1-12 Understand the unit question and their role as astronomers. Listen to the directions for the pre-unit assessments.	Walk students through slides 1-12 giving students opportunities to share their ideas. Introduce the unit question and the words: astronomer, star,. Then set students up to complete the pre-unit assessment during asynchronous time.	Complete the Pre-Unit Assessment.	Assign the Pre-Unit Assessment.

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

Asynchronous: students complete the written pre-unit assessment

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.

Synchronous: 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 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 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 constellations.

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

<table>
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