START HERE

Amplify Science

Grade 5

Instructional sampler

Amplify.

THE LAWRENCE HALL OF SCIENCE
UNIVERSITY OF CALIFORNIA, BERKELEY

Amplify Science

Suggested review experience

Welcome to Amplify Science! In your program sample, you'll find resources and program materials to help you in your review. We recommend exploring the materials in the following order:

1. Instructional sampler

This is what you're holding in your hands right now. The instructional sampler gives you high-level insights into the program's development and approach, information about the various program materials, and a step-by-step walkthrough of how to dig into the online experience for a thorough review.

2. Student print materials

Review the student print materials included in your sample. In this box, you have all of the print student materials used over the course of the year, including Student Investigation Notebooks and Student Books.

3. Exemplar print Teacher's Guide

Review the Teacher's Guide included in the box. The print Teacher's Guide is a printed version of the digital Teacher's Guide and allows you to plan for and deliver most instruction in the program. You'll need to access certain materials for instruction (projections, videos, etc.) via the digital Teacher's Guide.

4. Digital Teacher's Guide

Explore the digital version of the Teacher's Guide, as well as other program features, by visiting amplify.com/sciencek5. A guided tour will familiarize you with navigating the program and its features.

amplify.com/sciencek5

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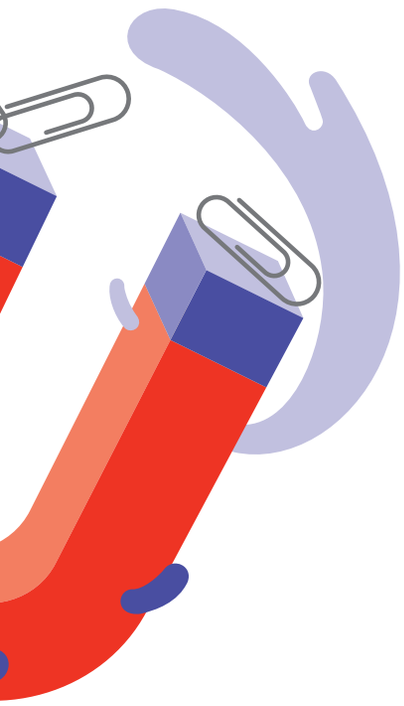



Gary's Sand Journal

About the program

About Amplify Science

In every unit of Amplify Science, students take on the roles of scientists and engineers to figure out real-world phenomena. Students actively investigate compelling questions by finding and evaluating evidence then developing convincing arguments.

In an Amplify Science classroom, students:

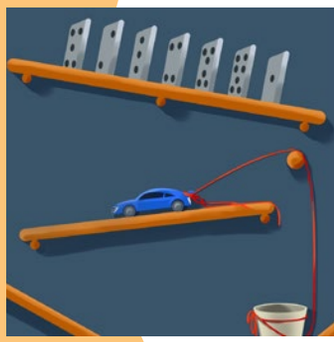
- ✔ **Collect evidence from a variety of sources.**
- ✔ **Make sense of evidence in a variety of ways.**
- ✔ **Formulate convincing scientific arguments.**

Built for new science standards and three-dimensional learning

The Next Generation Science Standards have raised the bar in science education. We set out to create a science program that educators can leverage to bring three-dimensional learning to life for their students. Educators who adopt Amplify Science have access to a comprehensive curriculum complete with detailed lesson plans, hands-on activities and materials, digital tools, embedded assessments, and robust teacher supports.

Amplify Science meets higher expectations for science teaching and learning:

- Anchor phenomena, explored through diverse interdisciplinary contexts, serve as the foundation for compelling, coherent storylines.
- Research-based multimodal learning allows students to develop expertise in all Science and Engineering Practices (SEPs) and deep understanding of Disciplinary Core Ideas (DCIs) and Crosscutting Concepts (CCCs) through experiences within a wide variety of contexts.
- Modeling tools enable students to create, and later revise, visualizations of their ideas of key scientific phenomena at critical points in the curriculum.
- Embedded engineering in units focused on engineering and technology emphasize that there's not always one right answer, as students balance competing constraints to design the best justifiable solutions.



A powerful partnership

THE LAWRENCE HALL OF SCIENCE
UNIVERSITY OF CALIFORNIA, BERKELEY

UC Berkeley's Lawrence Hall of Science has more than 40 years of experience improving K–12 science education. With 20 percent of K–12 classrooms using a Hall-developed instructional resource, and with legacy programs that include FOSS®, Seeds of Science/Roots of Reading®, GEMS®, SEPUP, and Ocean Science Sequences, the Hall's team has a deep understanding of what makes programs effective.

As the Hall's first K–5 science curriculum designed to address the new science standards, Amplify Science reflects state-of-the-art practices in science teaching and learning. Amplify's partnership with LHS runs through 2032 to ensure the program is continually enhanced and updated.

Amplify.

A pioneer in K–12 education since 2000, Amplify is leading the way in next-generation curriculum and assessment. Our captivating core and supplemental programs in ELA, math, and science engage all students in rigorous learning and inspire them to think deeply, creatively, and for themselves. Our formative assessment products turn data into practical instructional support to help all students build a strong foundation in early reading and math. All of our programs provide teachers with powerful tools that help them understand and respond to the needs of every student. Today, Amplify serves five million students in all 50 states.

Hear from our program authors

For 15 years, I've been fortunate to lead an outstanding team of scientists and educators as director of the Learning Design Group at UC Berkeley's Lawrence Hall of Science. We are extremely proud of Amplify Science and appreciate your taking the time to review the program. We developed Amplify Science to reflect the latest thinking and research about science teaching and learning. Along the way, we undertook extensive field testing to ensure our new program works well in real classrooms, with real students and teachers.

I think you'll find that Amplify Science stands apart from other middle school science programs in the following ways: a research-based, multimodal pedagogical approach where students learn to think like scientists and engineers by investigating real-world problems; a balanced blend of hands-on, digital, and literacy activities that are highly engaging and effective; embedded assessments that support differentiation for diverse learners; and robust teacher support for successful implementation. I hope you enjoy exploring the curriculum as much as we enjoyed creating it.

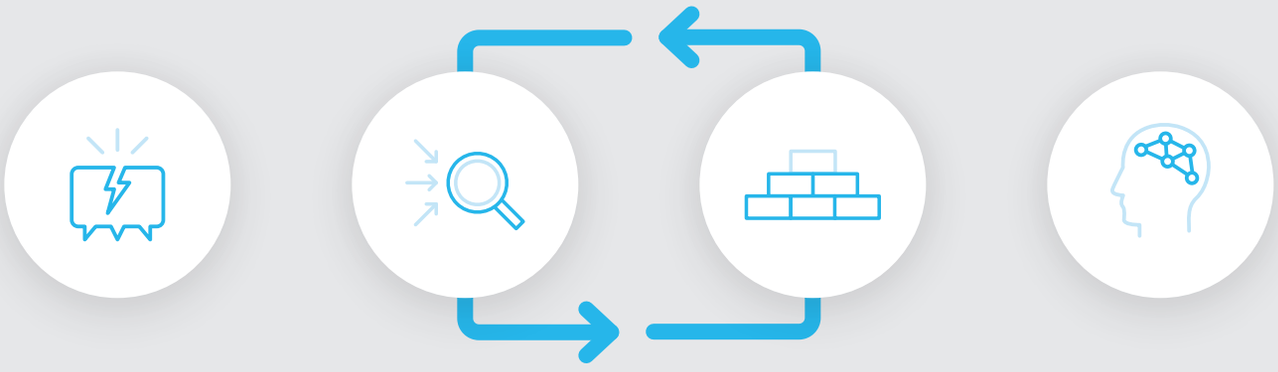
Sincerely,

Jacqueline Barber
Director, Learning Design Group,
Lawrence Hall of Science

A unique, phenomena-based approach

In each Amplify Science unit, students inhabit the role of a scientist or engineer in order to investigate a real-world problem. These problems provide relevant, 21st-century contexts through which students investigate different scientific phenomena.

To investigate these phenomena, students collect evidence from multiple sources and through a variety of modalities. They move back and forth from firsthand investigation to secondhand analysis and synthesis, formulating an increasingly complex explanation of the target phenomenon. Each unit also provides students with opportunities to apply what they have learned to solve new problems in different contexts. This enables students to demonstrate a deep understanding of phenomena and practices.



Engage students with a real-world problem

Explore evidence from multiple sources

Construct increasingly complex explanations

Apply knowledge to solve a different problem

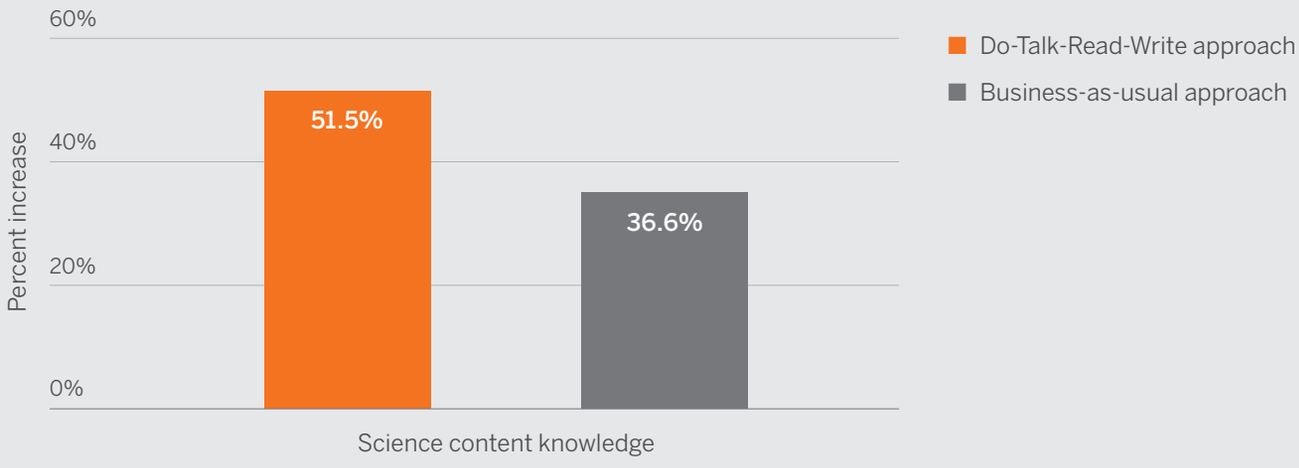
Grounded in research and proven effective

UC Berkeley's Lawrence Hall of Science, the authors behind Amplify Science, developed the Do, Talk, Read, Write, Visualize approach, and gold-standard research shows that it works. Our own efficacy research is pretty exciting, too.

Instructional model

Amplify Science is rooted in the research-based, iterative Do, Talk, Read, Write, Visualize model of learning. Three third-party gold-standard studies provide evidence that students who learn through the Do, Talk, Read, Write approach (used in the *Seeds of Science/Roots of Reading*® program, which formed the foundation for the Amplify Science approach) saw the following benefits:

- Students using a Do, Talk, Read, Write approach significantly outperformed other students receiving their usual science instruction in the areas of science content knowledge and science vocabulary.
- English Language Learners (ELLs) significantly outperformed other ELLs in science content knowledge and science vocabulary.



Source: Cervetti, Barber, Dorph, Pearson, & Goldschmidt, 2012; Duesbury, Werblow, & Twyman, 2011; Wang & Herman, 2005

Program structure

Units per year

Grades K–2: **3**

Grades 3–5: **4**

Unit types

Although every Amplify Science unit provides a three-dimensional learning experience, each unit contains multiple science and engineering practices, but has one of the following specific practices as its focus.

Investigation

Investigation units focus on the process of strategically developing investigations and gathering data to answer questions. Students are first asked to consider questions about what happens in the natural world and why, and are then involved in designing and conducting investigations that produce data to help answer those questions.

Modeling

These Amplify Science units emphasize opportunities for students to engage in the practice of modeling. Students use physical models, investigate with computer models, and create their own diagrams to help them visualize what might be happening on the nanoscale.

Course structure

Each unit includes two dedicated assessment days.

Key: (A) Argumentation (E) Engineering Design (I) Investigation (M) Modeling

Kindergarten

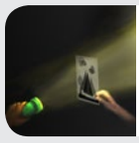
Needs of Plants and Animals
22 lessons (I)

Pushes and Pulls
22 lessons (E)

Sunlight and Weather
22 lessons (M)

Grade 1

Animal and Plant Defenses
22 lessons (M)



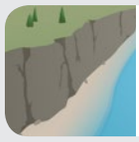
Light and Sound
22 lessons (E)

Spinning Earth
22 lessons (I)

Grade 2

Plant and Animal Relationships
22 lessons (I)

Properties of Materials
22 lessons (E)



Changing Landforms
22 lessons (M)

Engineering design

Engineering design solves complex problems by applying science principles to the design of functional solutions, and iteratively testing those solutions to determine how well they meet pre-set criteria. All Amplify Science engineering design units are structured to make the development of such solutions the central focus.

Argumentation (grades 3–5)

These Amplify Science units emphasize opportunities for students to engage in the practice of argumentation. As students move up the K–5 grades, they focus on important aspects of argumentation in an intentional sequence.

Grade 3

Balancing Forces

22 lessons

M

Inheritance and Traits

22 lessons

I

Environments and Survival

22 lessons

E

Weather and Climate

22 lessons

A

Grade 4

Energy Conversions

22 lessons

E

Vision and Light

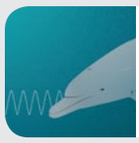
22 lessons

I

Earth's Features

22 lessons

A



Waves, Energy, and Information

22 lessons

M

Grade 5

Patterns of Earth and Sky

22 lessons

I

Modeling Matter

22 lessons

M

The Earth System

26 lessons

E

Ecosystem Restoration

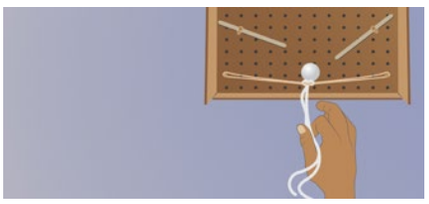
22 lessons

A

Phenomena and student roles in grades K–5

In every Amplify Science unit, students take on the role of scientists or engineers—marine biologists, geologists, water resource engineers, and more—to solve a real-world problem. These engaging roles and phenomena bring science to life in your classroom.

Examples



KINDERGARTEN

Pushes and Pulls

How can we create a pinball machine for our class?

Anchor phenomenon: Pinball machines allow people to control the direction and strength of forces on a ball.

Students take on the role of pinball machine engineers as they investigate the effects of forces on the motion of an object. They conduct tests in their own prototypes (models) of a pinball machine and use what they learn to contribute to the design of a class pinball machine. Over the course of the unit, students construct a foundational understanding of why things move in different ways.

GRADE 1

Animal and Plant Defenses

How can a sea turtle survive in the ocean after an aquarium releases it?

Anchor phenomenon: Spruce the Sea Turtle lives in an aquarium and will soon be released back into the ocean, where she will survive despite ocean predators.

Students play the role of marine scientists. In their role, students apply their understanding of plant and animal defense structures to explain to aquarium visitors how a sea turtle and her offspring can defend themselves from ocean predators when they are released into the wild.

GRADE 2

Changing Landforms

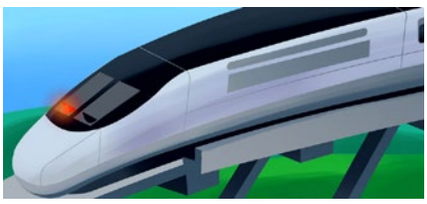
Why is the edge of the ocean cliff closer to the flagpole than it used to be?

Anchor phenomenon: The cliff that Oceanside Recreation Center is situated on appears to be receding over time.

The director of the Oceanside Recreation Center gets a scare when a nearby cliff collapses overnight. Research reveals that the distance between the recreation center's flagpole and the edge of the cliff has changed over time. **Students play the role of geologists and work to figure out why the cliff has changed over time.** Based on what they learn about erosion, they advise on whether it is safe to keep the center open even though the cliff is changing.

GO ONLINE

To read about the anchor phenomena and student roles for every Amplify Science unit, visit amplify.com/sciencek5.



GRADE 3

Balancing Forces

How is it possible for a train to float?

Anchor phenomenon: The town of Faraday is getting a new train that floats above its tracks.

People in Faraday are excited to hear that a new train service will be built for their city, but concerned when they hear that it will be a floating train. **Students take on the role of scientists in Faraday to figure out how a floating train works in order to explain it to the city's residents.** They develop models of how the train rises, floats, and then falls back to the track, and then write an explanation of how the train works.

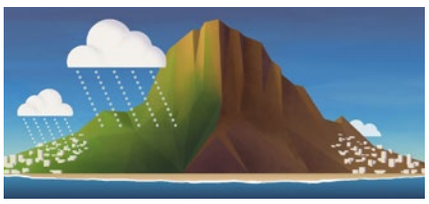
GRADE 4

Vision and Light

Why is an increase in light affecting the health of Tokay geckos in a Philippine rainforest?

Anchor phenomenon: The population of Tokay geckos in a rainforest in the Philippines has decreased since the installation of new highway lights.

As conservation biologists, students work to figure out why a population of Tokay geckos has decreased since the installation of new highway lights in the rainforest. Students use their understanding of vision, light, and information processing to figure out why an increase in light in the geckos' habitat is affecting the population.



GRADE 5

The Earth System

Why is East Ferris experiencing a water shortage and what can the city do about it?

Anchor phenomenon: East Ferris, a city on one side of the fictional Ferris Island, is experiencing a water shortage, while West Ferris is not.

The cities of East Ferris and West Ferris are located on different sides of a mountain on the fictional Ferris Island. East Ferris is having a water shortage while West Ferris is not. **As water resource engineers, students learn about the Earth system to help figure out what is causing the water shortage problem and design possible solutions, including freshwater collection systems and proposals for using chemical reactions to treat wastewater.**

Approach to assessment

The Amplify Science assessment system is grounded in the principle that students benefit from regular and varied opportunities to demonstrate understanding through performance.

Each unit includes a range of formative assessments embedded in instruction with the goal of providing regular, actionable information to the teacher with minimal impact on instructional time.

The variety of assessment options for Amplify Science K–5 include:

F **Formative** S **Summative**

Formative

Pre-Unit Assessment

These assessments make use of discussion, modeling, and written explanations to gauge student knowledge prior to starting a unit.

Formative

On-the-Fly Assessments (OtFAs)

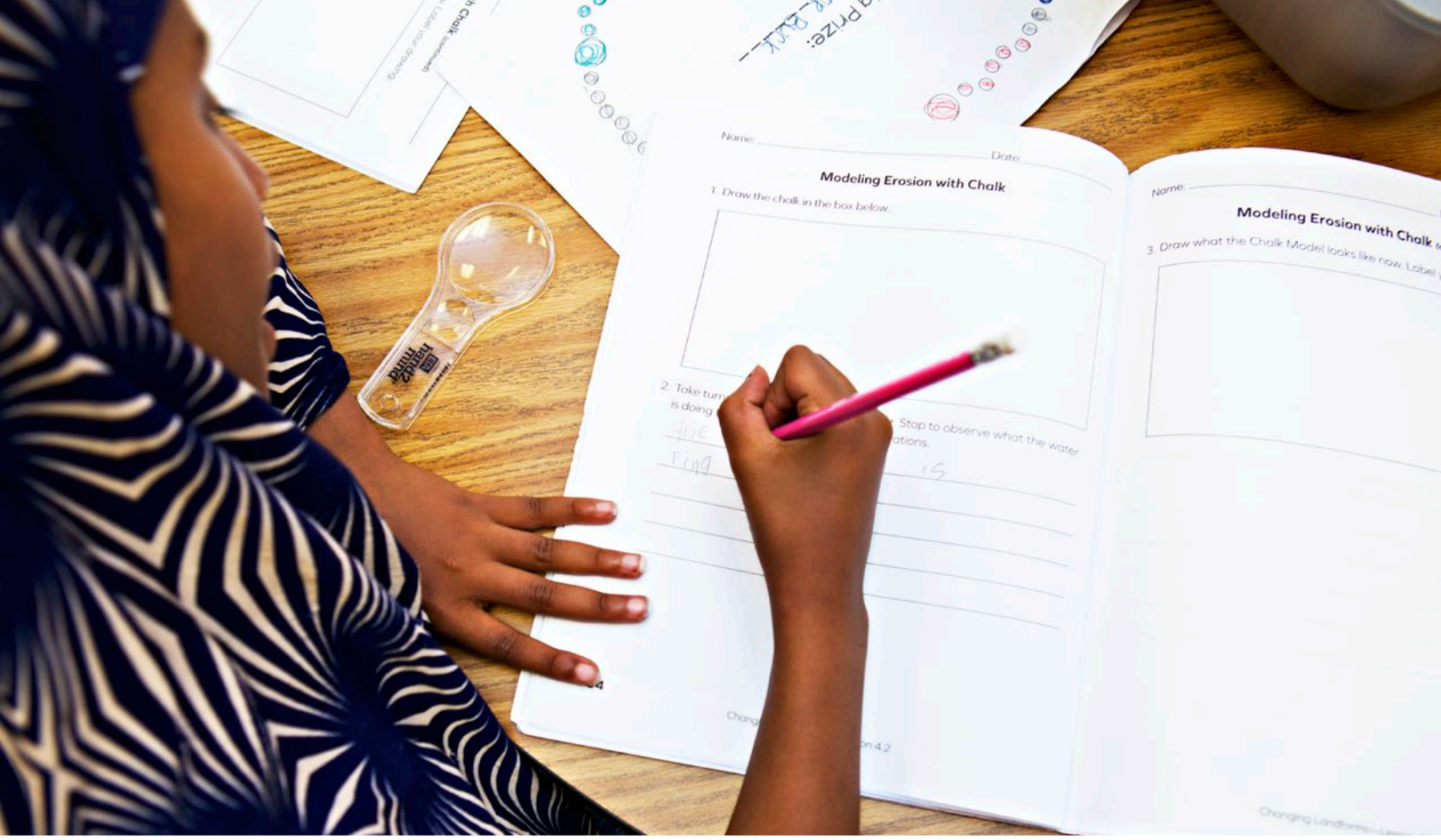
Multidimensional assessments integrated regularly throughout the lessons. OtFA opportunities were designed to help a teacher make sense of student activity during a learning experience and to provide evidence of how a student is coming to understand core concepts and developing dexterity with SEPs and CCCs.

Self-Assessments

Once per chapter, students are given a brief opportunity to reflect on their own learning, ask questions, and reveal ongoing wonderings about unit content. Students respond to a consistent set of prompts each time, ensuring that their own progress is visible to them.

Critical Juncture Assessments

Each chapter includes an integrated multidimensional performance task that supports students' consolidation of the ideas encountered in the chapter and provides insight into students' developing understanding. Examples include writing scientific explanations, engaging in argumentation, developing and using models, and designing engineering solutions.



Summative

End-of-Unit Assessment

Assessments toward the end of each unit feature a combination of targeted discussions, student-generated models, and written explanations or arguments to enable students to demonstrate understanding and growth at the conclusion of a unit.

NGSS BENCHMARK ASSESSMENTS

Developed by Amplify, the Next Generation Science Standards (NGSS) Benchmark Assessments give you insight into how your students are progressing toward mastery of the three dimensions and performance expectations of the NGSS ahead of high-stakes end-of-year assessments. They are given 3–4 times per year, depending on the grade level, and are delivered after specific units in the recommended Amplify Science scope and sequence.


KINDNESS
Gates 2nd Grade
CB Cart
#17

Engaging materials

Hands-on investigations in grades K–5

Hands-on learning is an essential part of Amplify Science, and is integrated into every unit. Students actively participate in science, playing the roles of scientists and engineers as they gather evidence, think critically, solve problems, and develop and defend claims about the world around them. Every unit includes hands-on investigations that are critical to achieving the unit's learning goals.

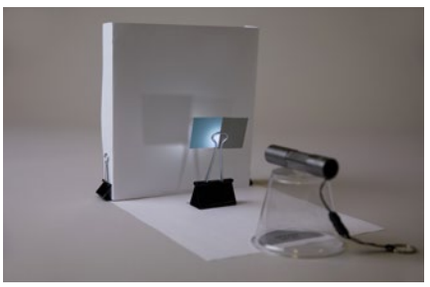
Examples

KINDERGARTEN

Pushes and Pulls

Showcasing the Box Models (Lesson 5.3)

In Lesson 5.2 of Pushes and Pulls, students synthesize what they have figured out about force and motion to create a culminating design for their pinball machine models. Students incorporate a launcher, flippers, and bumpers into their model to help their pinball reach a target. Students then test their models to observe whether or not their solutions work as expected, and then make any additional modifications as necessary.

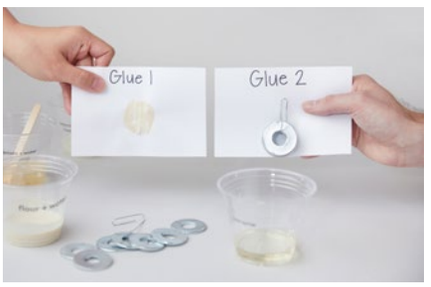


GRADE 1

Light and Sound

Investigating Materials That Do Not Block (Lesson 3.1)

By Lesson 3.1 of Light and Sound, students have figured out that not all materials block light to create a dark area on a surface. Partners use their Investigation Kits to test non-blocking materials (clear plastic, tinted plastic, and wax paper) in comparison to cardboard, a known blocking material. Students use their observations of these materials comparisons to discuss what may cause variation in the brightness of the areas created on a surface.



GRADE 2

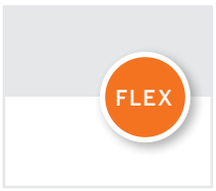
Properties of Materials

Making Our Second Glue and Setting Up Tests (Lesson 3.5)

In Lesson 3.5 of Properties of Materials, students apply the evidence that they have collected about the properties of glue ingredients to create a recipe for a glue that meets a series of design goals. Students use available ingredients to create their unique glue and then set up a fair test with partners that will allow them to compare the properties of their glues.

GO ONLINE

For a complete materials list and to see more example activities, visit amplify.com/sciencek5.



Hands-on Flextensions

Hands-on Flextensions are additional, optional investigations that are included at logical points in the learning progression and give students an opportunity to dig deeper if time permits. These activities offer teachers flexibility to choose to dedicate more time to hands-on learning.

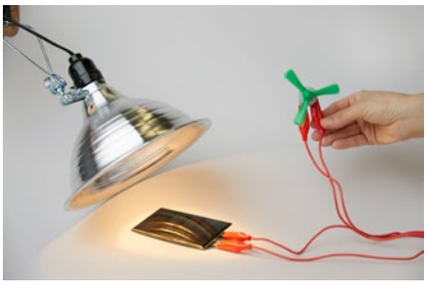
Materials referenced in Hands-on Flextension activities will either be included in the unit kit or are easily sourced. Supporting resources such as student worksheets will be included as downloadable PDF files.

GRADE 3

Inheritance and Traits

Exploring Inheritance (Lesson 2.4)

In Lesson 2.4 of Inheritance and Traits, students investigate how traits are passed down from parents to offspring by building clay creature offspring. Students work in pairs to make clay creature offspring with specific traits based on instructions that were randomly inherited from two parent creatures. In the discussion following the activity, students compare creatures and observe that, although the offspring inherited instructions from the same parents, there is variation in traits among siblings.



GRADE 4

Energy Conversions

Designing Wind Turbines (Lesson 3.4)

In Lesson 3.4 students are introduced to their first hands-on design challenge: to design and build a wind turbine. Students receive two proposed solutions to the blackout problem in Ergstown, both of which are intended to bring more energy to the electrical system: installing solar panels or installing wind turbines. In order to make an informed choice between the two proposed solutions, students are given a design challenge: to build a wind turbine that meets certain design criteria. Students then engage in the design cycle as they explore the available materials and plan, make, and test their wind turbine designs.

GRADE 5

The Earth System

Observing Substances and Mixing Substances (Lesson 5.1)

In Lesson 5.1 of The Earth System, students investigate how new substances form. Students observe a chemical reaction by mixing calcium chloride, baking soda, and phenol red solution. They discuss and record their observations of the substances before, during, and after the reaction.

GO ONLINE

Preview all Student Books in grades K–5 at amplify.com/sciencek5.

Student Books

About the books

Each unit of Amplify Science K–5 includes five unique Student Books written by the Lawrence Hall of Science specifically for the program. The five books in each unit include one book for approximately every five days of instruction and one reference book that students draw upon throughout the unit.

These content-rich nonfiction and informational texts provide opportunities for students to search for evidence relevant to their firsthand investigations, see science practices and dispositions modeled, extend their science knowledge, provide real world connections as they master reading-to-learn and close reading skills, and construct evidence-based arguments.

Instructional approach

Beginning and young readers have unique developmental needs, and science instruction should support these students in reading more independently as they progress through sections of content, the school year, and each grade.

One way Amplify Science meets these needs is by strategically deploying different modes of reading throughout each unit: Read-Aloud, Shared Reading, and Partner Reading.

Read-Aloud

In the Read-Aloud mode, the teacher reads the book while students listen. During a Read-Aloud, the teacher models fluent and expressive reading, demonstrates strategic reading, thinks aloud about the content of the book, introduces new vocabulary, and facilitates students' comprehension as the class gathers information to figure out a science idea. In grades K–1, all Student Books are also included as Big Books for read-alouds.

Shared Reading

In the Shared Reading mode, the teacher and students interact with the book together. Shared Reading provides additional opportunities for students to observe the teacher as an expert reader, to actively join in the discussion about the book, and to practice using a focal comprehension strategy.

Partner Reading

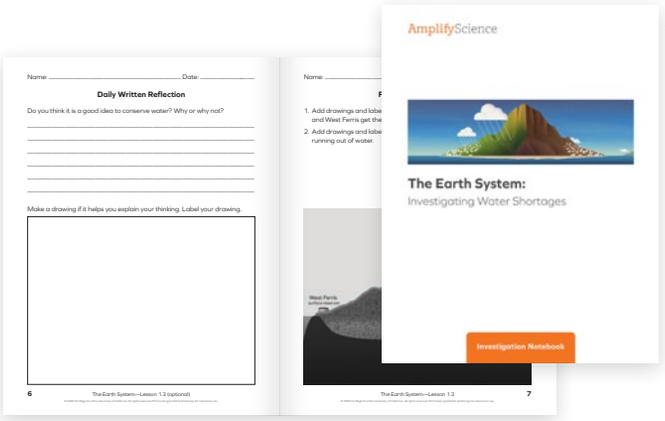
In Partner Reading mode, two students work together to read or gather information from a book. Partner Reading provides opportunities for each student in a pair to be the reader and the supporter while reading a text.

SPANISH LANGUAGE SUPPORT

All Student Books are also available in Spanish.

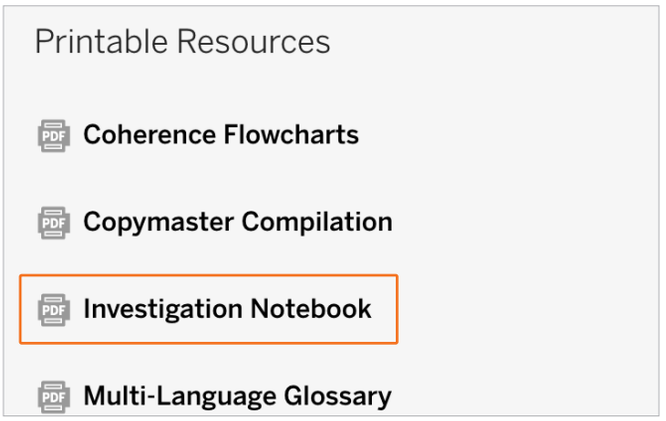
Student Investigation Notebooks

Every unit in Amplify Science has a Student Investigation Notebook, where students record data and observations, make drawings, and complete writing tasks. Scaffolding supports for reading and writing activities are also included in each notebook.



In grades K–5, one copy of the Student Investigation Notebook is included in each unit's materials kit for use as a blackline master.

The Student Investigation Notebook for each unit is also available as a downloadable PDF on the Unit Guide page of the digital Teacher's Guide.



SPANISH LANGUAGE SUPPORT

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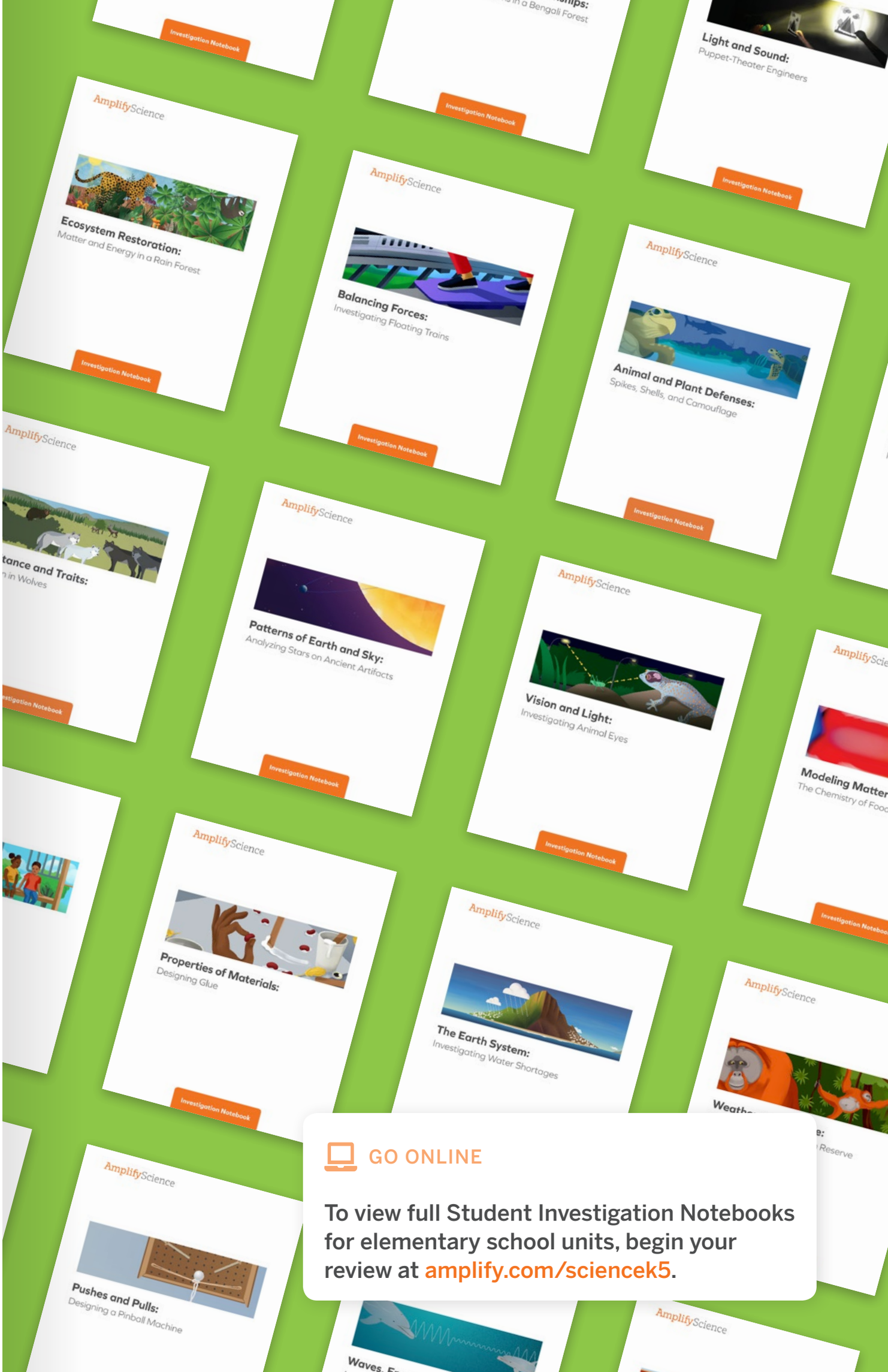


GO ONLINE

To view full Student Investigation Notebooks for elementary school units, begin your review at amplify.com/sciencek5.

Digital resources

Students have access to a variety of digital tools to enrich their learning throughout the Amplify Science K–5 program.

Grades K–1

In kindergarten and grade 1, students observe various types of media (videos, images, etc.) through teacher projections. In these grade levels, however, students are not expected to access their own digital experiences.

Grades 2–3

In grades 2 and 3, some student-facing technology is available, with four to five lessons per unit that have activities where students can use science practice tools to to aid in the modeling, graphing, and sorting of information related to the unit's central problem. (A unit has 22 lessons total.)

Grades 4–5

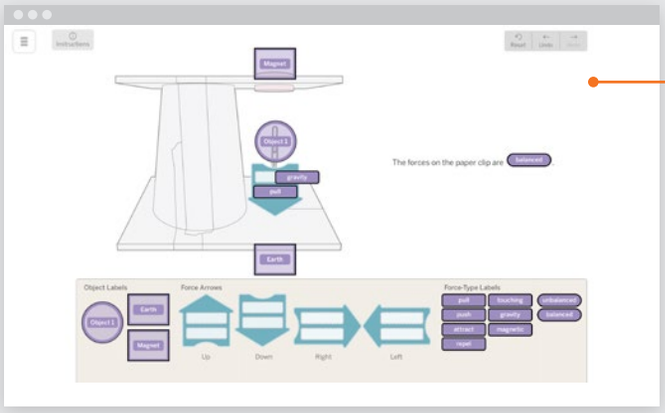
Students in grades 4 and 5 use digital tools and simulations more frequently, with 30-40 percent of lessons including opportunities to use a digital tool.

Videos

Videos are incorporated into Amplify Science units across grades K–5. Whenever a video is present, the teacher projects the video to the students from their own device. Students are never prompted to access videos themselves in Amplify Science grades K–5. If a teacher does not have internet access in the classroom, they can download videos before class.

Practice Tools

A collection of unit-specific digital apps, Practice Tools include simple drag-and-drop activities or easy-to-use data-entry tools to aid students with sorting, modeling, or visualizing information. Practice Tools are included in each unit in grades 2–5, appearing in approximately three to five lessons per unit.



Modeling Tool

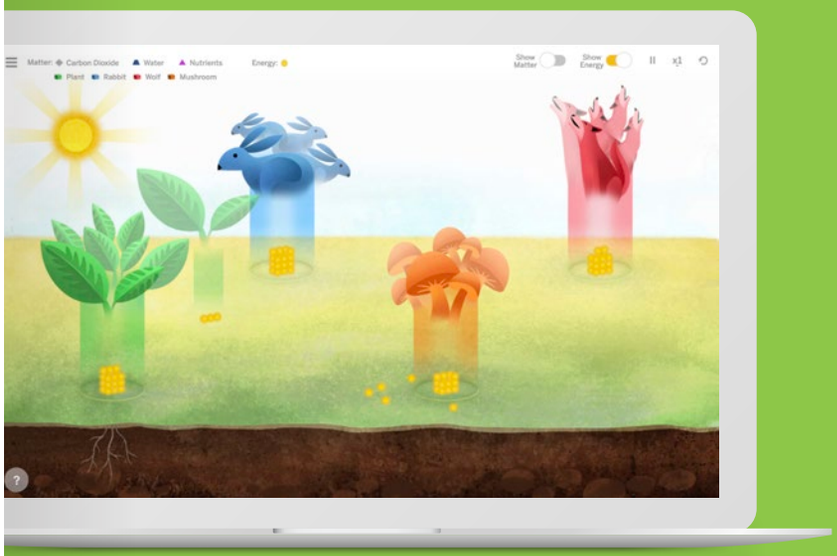
Data Tool

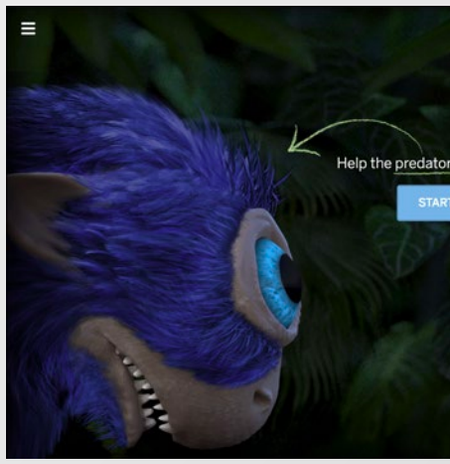
Digital simulations

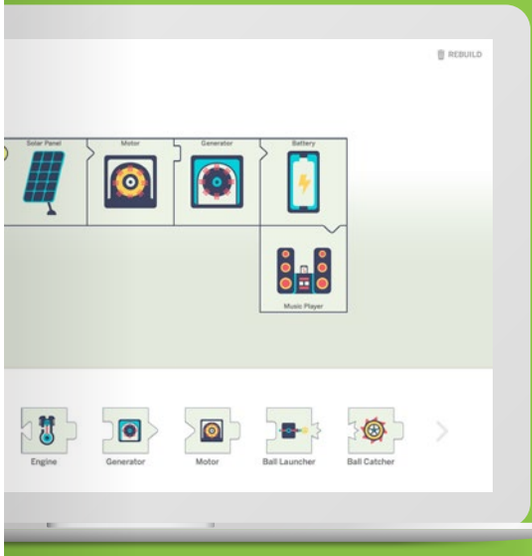
One unit in grade 3 and all units in grades 4 and 5 include the opportunity to use a unique digital simulation ("Sim"). Sims allow students to explore scientific concepts that might otherwise be invisible or impossible to see with the naked eye.

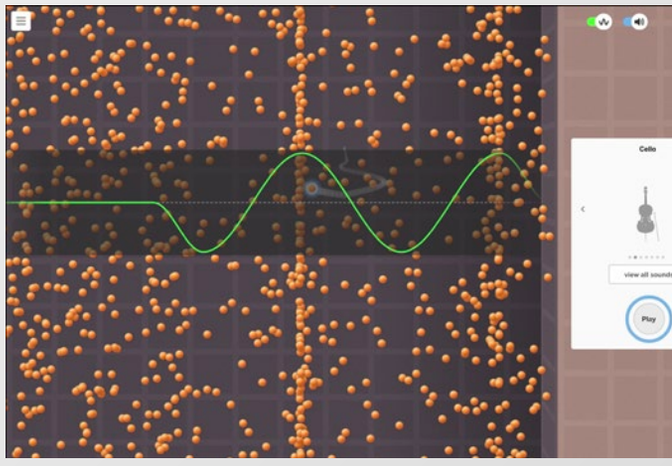
Much like real scientists do, students will use these computer simulations to gain insight into processes that occur on the microscopic scale, or to speed up processes that might otherwise take thousands or millions of years to observe.

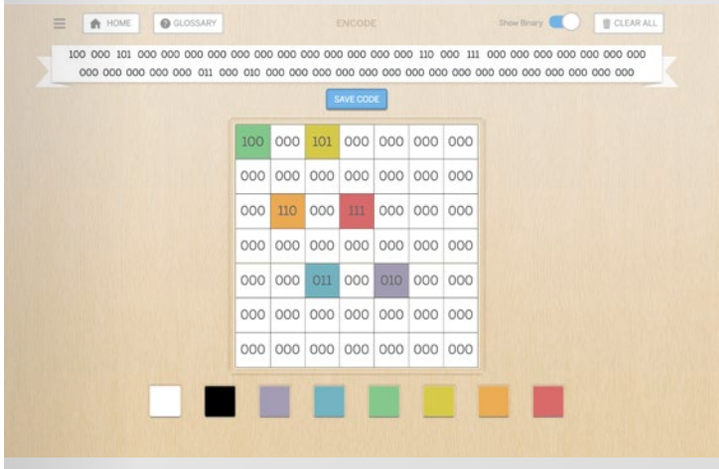
Simulations are just one of several components teachers will use to teach a given scientific concept. The same concepts will be explored through hands-on activities, Student Books written for the unit, classroom discussions, and more. Each of these tools and techniques gives every student multiple opportunities and modalities through which to explore and ultimately figure out the scientific concept. Sims appear in five to nine lessons per unit in the grade 4 and grade 5 units.

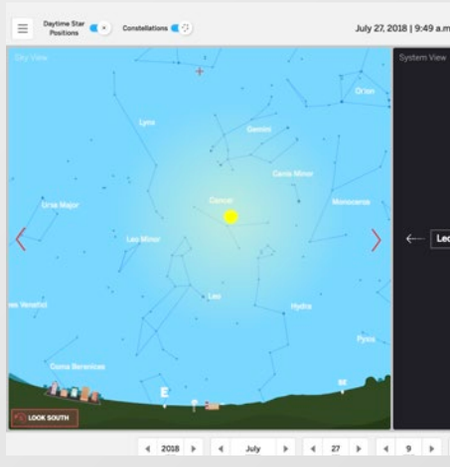

Matter: Carbon Dioxide Water Nutrients
Plant Rabbit Wolf Mushroom
Energy:
Show Matter
Show Energy
x1


Help the predator
START


REBUILD
Solar Panel
Motor
Generator
Battery
Music Player
Engine
Generator
Motor
Ball Launcher
Ball Catcher


Cello
Play


HOME
GLOSSARY
ENCODE
Show Binary
CLEAR ALL
SAVE CODE

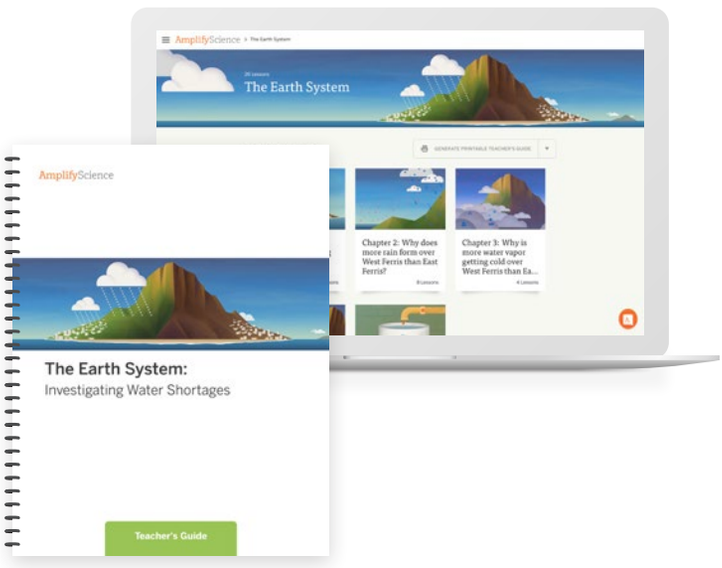

Daytime Star Positions
Constellations
July 27, 2018 | 9:49 a.m
LOOK SOUTH
2018
July
27
9

Teacher's Guides

Every unit of Amplify Science includes a comprehensive Teacher's Guide containing lesson plans, differentiation strategies, and other instructional supports and resources at the unit, lesson, and individual activity levels.

Plan for instruction

Teachers can access their lesson plans through the print or digital Teacher's Guides. Both formats include the same unit-level overview and preparation information, as well as step-by-step instructions for every activity in every lesson.



The Teacher's Guide contains step-by-step teaching instructions, which include:

- Teacher Supports, which note background information, pedagogical rationale, or instructional suggestions for the teacher.
- Possible Responses, which provide information about how to evaluate student work. These are found at the end of the Activity in a shaded box.
- On-the-Fly Assessments, which offer guidance for using formative assessment opportunities.

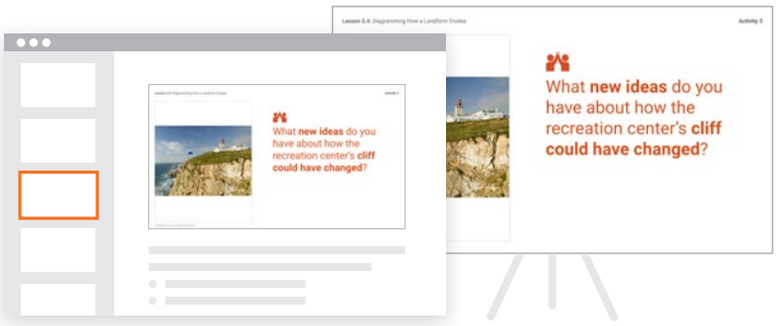
SPANISH LANGUAGE SUPPORT

A Spanish add-on license gives teachers access to lesson projections, PDFs of print materials, and recommended in-class "teacher talk" moments in Spanish.

GO ONLINE

Log into the digital Teacher's Guide and explore digital tools in Amplify Science at amplify.com/sciencek5.

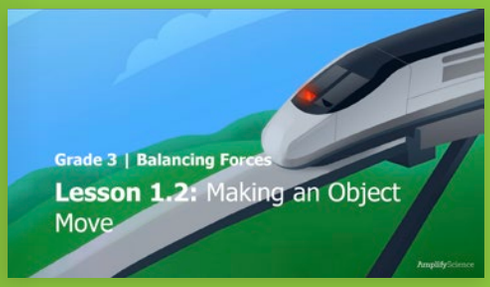
Deliver instruction

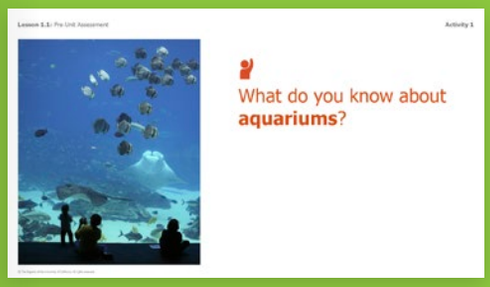


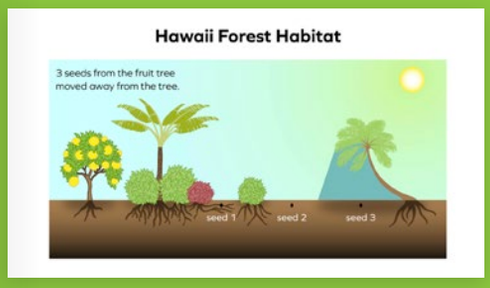
Classroom Slides

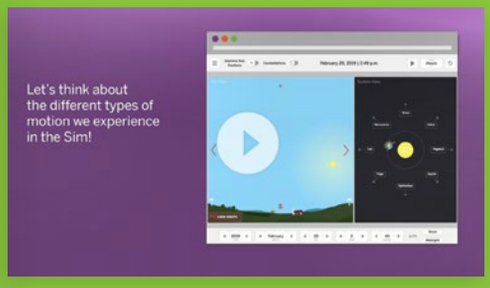
To make planning and delivering instruction faster and easier, Amplify has developed Classroom Slides for all K–5 lessons. Each lesson comes with a downloadable and editable PowerPoint file to help guide teachers and their students through the lesson with clearly-sequenced, engaging, and easy-to-follow images, videos, questions, and instructions.

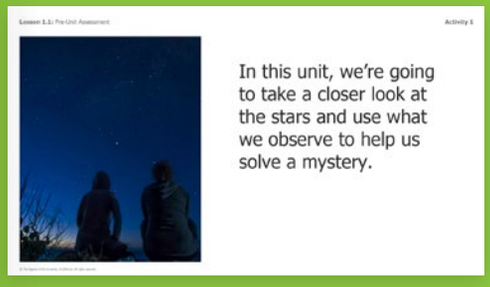
Classroom Slides allow teachers to easily customize their lessons and streamline the in-class presentation experience. Slides take key lesson content—including student-facing questions, teacher prompts, activity transitions, and visuals—and put it in a logical sequence. At any time, teachers can feel free to change the wording, paste in a new visual, or link to their favorite YouTube video.

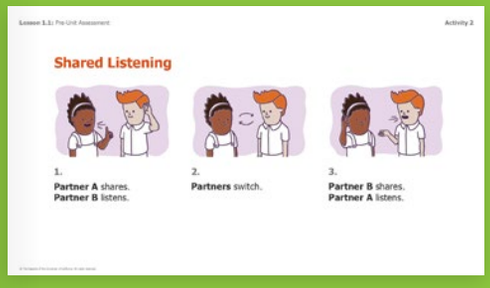












In your classroom

Grade 5: Year at a glance

Grade 5 in Amplify Science contains four units, each containing two dedicated assessment days and 20–24 60-minute lessons.

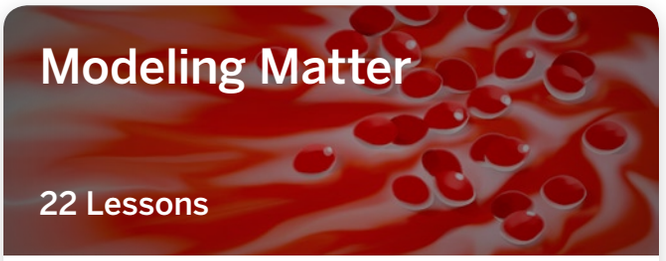
20 60-minute lessons
2 dedicated assessment days
Investigation focus

In *Patterns of Earth and Sky: Analyzing Stars on Ancient Artifacts*, students learn that stars are all around us in space, develop an understanding of scale and distance in the universe, and discover how the spin and orbit of our planet causes us to observe daily and yearly patterns of stars.

Student role and phenomena
In this unit, students take on the role of astronomers, helping a team of archaeologists at the fictional Museum of Archaeology figure out and explain the significance of the illustrations on a recently discovered thousand-year-old artifact with a missing piece.

Insights
Students observe and investigate patterns in the sky by day and night using kinesthetic models, a digital simulation, and informational text. Students apply their understandings of why we see different stars at different times to explain what is shown on the artifact, and what might be on the missing piece.

Focal NGSS Performance Expectations:
5-ESS1-1 • 5-ESS1-2 • 5-PS2-1



20 60-minute lessons
2 dedicated assessment days
Modeling focus

In *Modeling Matter: The Chemistry of Food*, students have the opportunity to dive deep into understanding the particulate nature of matter and apply it to explaining phenomena at the macroscale (the observable scale).

Student role and phenomena
Students assume the role of food scientists working in the research lab at Good Food Production, Inc. to make observations of food mixtures.

Insights
By the end of the unit, students will understand that there is a connection between the observable properties of materials and the properties of the molecules of which those materials are composed.

Focal NGSS Performance Expectations:
5-PS1-1 • 5-PS1-2 • 5-PS1-3

24 60-minute lessons
2 dedicated assessment days
Engineering design focus

In *The Earth System: Investigating Water Shortages*, students learn about the Earth system so they can help figure out what is causing a water shortage. They also design ways to alleviate the effects of water shortages, including freshwater collection systems and proposals for using chemical reactions to treat wastewater.

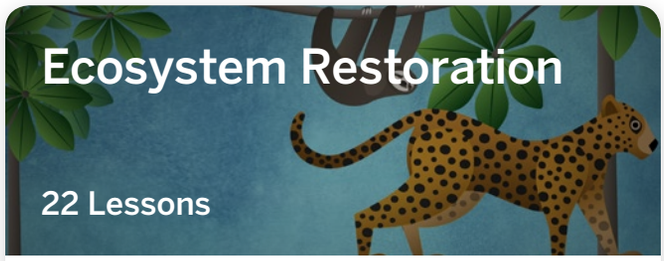
Student role and phenomena

In the role of water resource engineers, students investigate what makes East Ferris, a city on one side of the fictional Ferris Island, prone to water shortages while a city on the other side is not.

Insights

Students use books, hands-on investigations, and The Earth System simulation and modeling tool to figure out how water is distributed within the hydrosphere, how water moves between the hydrosphere and the atmosphere to cause rain, how the geosphere can interact with the hydrosphere and atmosphere to create patterns of rain, and how life forms in the biosphere depend on the hydrosphere.

Focal NGSS Performance Expectations:
5-ESS2-1 • 5-ESS2-2 • 5-ESS3-1 • 5-PS1-1 • 5-PS1-2
5-PS1-4 • 3-5-ETS1-1 • 3-5-ETS1-2 • 3-5-ETS1-3



20 60-minute lessons
2 dedicated assessment days
Argumentation focus

In *Ecosystem Restoration: Matter and Energy in a Rain Forest*, students explore what it means to grow and how living things get the matter and energy they need to grow.

Student role and phenomena

As ecologists working with Natural Resources Rescue, a fictional organization dedicated to protecting Earth's fragile ecosystems, students work to explain why jaguars, sloths, and cecropia trees in a reforested section of a Costa Rican rain forest are not growing and thriving.

Insights

Throughout the unit, students engage in oral and written scientific argumentation about the source of the problem in the failing ecosystem. By the end of the unit, students present their final restoration plans, including a recommended course of action to restore the failing rainforest ecosystem to its original condition.

Focal NGSS Performance Expectations:
5-LS1-1 • 5-LS2-1 • 5-PS1-1 • 5-PS3-1 • 5-ESS3-1

Deep dive: The Earth System

Take a closer look at the lessons and activities in the "The Earth System" unit.

CHAPTER 1 – DAY 1

Lesson 1.1
Pre-Unit Assessment

DAY 2

Lesson 1.2
Water Shortages, Water Solutions

DAY 3

Lesson 1.3
Explaining the East Ferris Water Shortage

DAY 6

Lesson 2.3
A Nanoscale View of Condensation

DAY 7

Lesson 2.4
Investigating Evaporation

DAY 8

Lesson 2.5
Drinking Cleopatra's Tears

DAY 11

Lesson 2.8
Engineering Clean Water

CHAPTER 3 – DAY 12

Lesson 3.1
Investigating Where Raindrops Form

DAY 13

Lesson 3.2
Making Sense of Where Raindrops Form

CHAPTER 4 – DAY 16

Lesson 4.1
Investigating the Movement of Water Vapor

DAY 17

Lesson 4.2
Investigating Rainfall Distribution

DAY 18

Lesson 4.3
End-of-Unit Assessment Part 1

CHAPTER 5 – DAY 21

Lesson 5.1
Investigating Wastewater Treatment

DAY 22

Lesson 5.2
Chemical Reactions Everywhere

DAY 23

Lesson 5.3
Chemical Reactions at the Nanoscale

DAY 26

Lesson 5.6
Reflecting on Water Availability

CHAPTER 2 – DAY 4

Lesson 2.1
Investigating Water Drop Formation

DAY 5

Lesson 2.2
From Water Vapor to Liquid Water

DAY 9

Lesson 2.6
Explaining How Raindrops Form

DAY 10

Lesson 2.7
Designing Freshwater Collection Systems

DAY 14

Lesson 3.3
Explaining Why It Rains

DAY 15

Lesson 3.4
Iterating on Freshwater Collection Systems

DAY 19

Lesson 4.4
How the Earth System Explains Dinosaur Extinction

DAY 20

Lesson 4.5
Final Design Iterations

DAY 24

Lesson 5.4
Controlling Chemical Reactions

DAY 25

Lesson 5.5
End-of-Unit Assessment Part 2

Lesson includes a reading activity with Student Books

Lesson includes a hands-on investigation

Lesson includes scientific writing activity

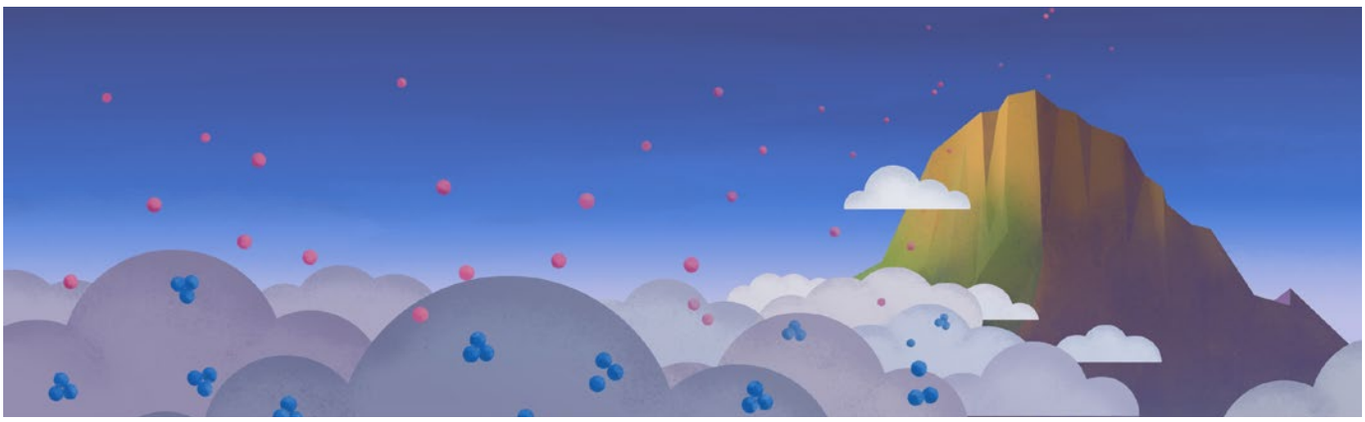
Lesson includes use of digital modeling tools

Dedicated assessment day

Lesson includes a discussion activity

Unit storyline: The Earth System

On the following pages, you'll find teacher and student sample pages and highlights of digital features for the "The Earth System" unit. Follow along with the print Teacher's Guide included in your sample or online with the digital Teacher's Guide.



Water scarcity currently affects about one-fifth of the world's population, and the number of people facing water shortages is growing. Despite the major problem that water scarcity presents, many students lack knowledge of water distribution, the natural factors that determine water availability, and how people impact water supplies.

In the role of water resource engineers, students investigate what makes East Ferris, a city on one side of the fictional Ferris Island, prone to water shortages while a city on the other side is not. This serves as the anchor phenomenon for the unit. Investigating what determines how much water is available for human use leads students to explore how parts of the Earth system interact.

Students use books, hands-on investigations, and The Earth System simulation and modeling tool to figure out how water is distributed within the hydrosphere, how water moves between the hydrosphere and the atmosphere to cause rain, how the geosphere can interact with the hydrosphere and atmosphere to create patterns of rain, and how life forms in the biosphere depend on the hydrosphere. Students use their understanding of how parts of the Earth system interact to explain why one side of Ferris Island is experiencing a water shortage.

Students also design freshwater collection systems as a possible solution for East Ferris's water shortage problem, and iterate on their designs throughout the unit. They then learn about another solution: treating wastewater to turn it into clean freshwater. Students discover that, in chemical reactions, substances are mixed and at least one new substance with different properties is formed. They apply this idea to explain how wastewater treatment can remove harmful substances from the city's water and make it safe to reuse.

IN YOUR CLASSROOM

Sample unit walkthrough

Walkthrough progress PLAN TEACH ASSESS

Teacher sample page: Unit Overview

Unit Overview

The Earth System
Planning for the Unit

Unit Overview

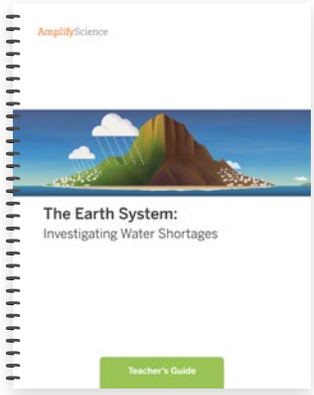
What's in This Unit?

Water scarcity currently affects about one-fifth of the world's population, and the number of people facing water shortages is growing. Despite the major problem that water scarcity presents, many students lack knowledge of water distribution, the natural factors that determine water availability, and how people impact water supplies. In the role of water resource engineers, students investigate what makes East Ferris, a city on one side of the fictional Ferris Island, prone to water shortages while a city on the other side is not. This serves as the anchor phenomenon for the unit. Investigating what determines how much water is available for human use leads students to explore how parts of the Earth system interact. Students use books, hands-on investigations, and *The Earth System* Simulation and Modeling Tool to figure out how water is distributed within the hydrosphere, how water moves between the hydrosphere and the atmosphere to cause rain, how the geosphere can interact with the hydrosphere and atmosphere to create patterns of rain, and how life forms in the biosphere depend on the hydrosphere. Students use their understanding of how parts of the Earth system interact to explain why one side of Ferris Island is experiencing a water shortage. Students also design freshwater collection systems as a possible solution for East Ferris's water shortage problem, and iterate on their designs throughout the unit. They then learn about another solution: treating wastewater to turn it into clean freshwater. Students discover that, in chemical reactions, substances are mixed and at least one new substance with different properties is formed. They apply this idea to explain how wastewater treatment can remove harmful substances from the city's water and make it safe to reuse.

Why?

Understanding how the parts of the Earth system interact to create natural phenomena is an expectation of The Next Generation Science Standards (NGSS), as is understanding how people affect and protect Earth's resources. There are many different ways that one could engage students with these ideas. We chose to focus on having them figure out the phenomenon of the rain shadow effect—the uneven pattern of rain that occurs when wind blows from a body of water toward a mountain and creates a lot of rain on the windward side of the mountain and very little on the leeward side. Setting this central scientific phenomenon in the context of a water shortage establishes a rich framework for investigation. Figuring out why there is a water shortage on one side of Ferris Island but not the other requires students to understand many things about how the parts of the Earth system—the hydrosphere, atmosphere, geosphere, and biosphere—interact with one another, including natural and human factors that affect water availability. This unit urges students to think about freshwater as a limited resource on Earth which people must use mindfully. Recognizing the myriad interactions in the Earth system is foundational to describing many important cycles and processes in Earth Science.

To understand the atmosphere and its interactions with other parts of the Earth system, students must believe that air is matter—a concept that students are expected to understand at grade 5 but many still struggle with. This unit provides students with various sources of evidence and multiple opportunities to make sense of the idea that air is matter. In grade 5, an increasing amount of what students are expected to understand is not directly visible. Having access to *The Earth System* Simulation enables students to visualize nanoscale particles, which will help them to explain observable phenomena. Students are compelled to recognize the existence and movement of invisible water vapor in the air all around them in order to explain why more rain forms in some places than others.

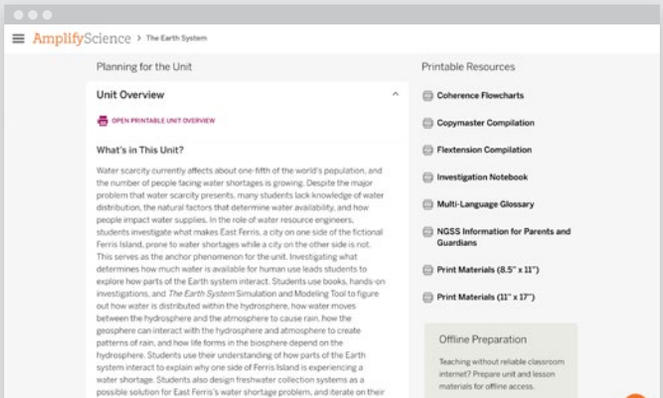


Find the Unit Overview in the exemplar Teacher's Guide included in your sample.

The Unit Overview provides you with an outline of the unit, including what the unit is about, why the unit was written this particular way, and how students will experience the unit. The Unit Overview is one of the most important documents for teachers to review before teaching a unit.

GO ONLINE

To access the Unit Overview in the digital Teacher's Guide, expand the "Unit Overview" section of the Unit Guide when you first click into a unit. The Unit Overview is also downloadable as a PDF.



Walkthrough progress PLAN TEACH ASSESS

Teacher sample page: Unit Map

The Earth System
Planning for the Unit

Unit Map

Unit Map

What can determine how much water is available for human use?

The cities of East Ferris and West Ferris are located on different sides of a mountain on the fictional Ferris Island. East Ferris is having a water shortage while West Ferris is not. As water resource engineers, students learn about the Earth system so they can help figure out what is causing the water shortage on one part of the island. They also design ways to alleviate the effects of water shortages, including freshwater collection systems and proposals for using chemical reactions to treat wastewater.

Chapter 1: Why is East Ferris running out of water while West Ferris is not?

Students figure out: Ferris Island is surrounded by ocean, but salt water is unusable for most human purposes. East Ferris's growing population is using up their only freshwater source, a groundwater reservoir, whereas West Ferris has an additional source of freshwater—rain.

How they figure it out: Students define the problem in East Ferris by analyzing graphs of global water distribution and reading about water shortages. They discuss how the biosphere and hydrosphere interact and write a scientific explanation about why East Ferris is experiencing a water shortage.

Chapter 2: Why does more rain form over West Ferris than East Ferris?

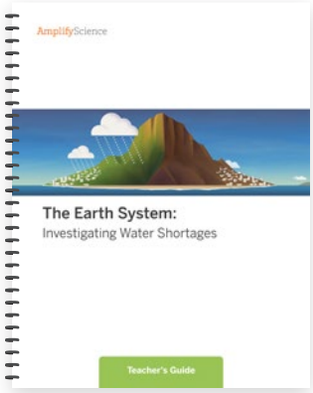
Students figure out: More rain forms over West Ferris because more water vapor condenses there. During condensation, water vapor gets colder and turns into liquid water. There is a lot of water getting cold in West Ferris, so a lot of rain forms. There is not a lot of rain forming over East Ferris, so there is not a lot of water vapor getting colder and condensing into liquid water there.

How they figure it out: Students gather information from hands-on investigations, *The Earth System* Simulation, and texts that help them understand condensation and evaporation at two scales: the observable and the nanoscopic. They apply this to a discussion of how the atmosphere and hydrosphere interact. They also design and build freshwater collection systems.

Chapter 3: Why is more water vapor getting cold over West Ferris than East Ferris?

Students figure out: There is more water vapor getting cold over West Ferris because on that side of the island more water vapor moves upward in the atmosphere where it is colder. This means that more water vapor can condense and fall as rain.

How they figure it out: Students synthesize information from text, physical models, and the Simulation to determine that at higher elevations in the atmosphere where it is colder, water vapor can condense. They also evaluate and iterate on their freshwater collection system designs.

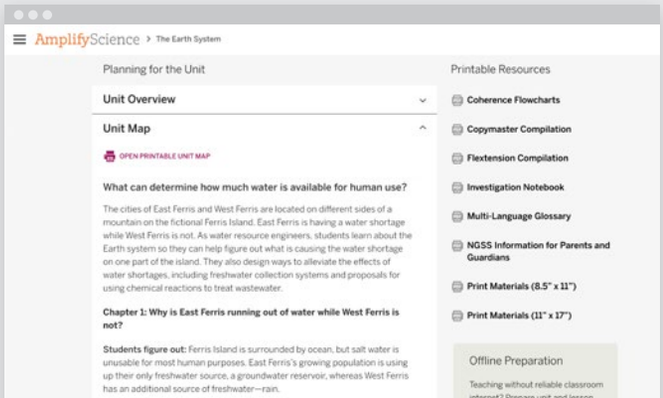


Find the Unit Map in the exemplar Teacher's Guide included in your sample.

The Unit Map is a summary that shows teachers how chapters within the unit build upon each other, what questions students will investigate, and what evidence sources they will use to figure those questions out.

GO ONLINE

To access the Unit Map in the digital Teacher's Guide, expand the "Unit Map" section of the Unit Guide when you first click into a unit. The Unit Map is also downloadable as a PDF.



Walkthrough progress PLAN TEACH ASSESS

Teacher sample page: Instructional Guide

Lesson 1.1
Activity 1

The Earth System
Lesson Guides

1 TEACHER-LED DISCUSSION
Introducing the Unit

Introducing the Unit

10 MIN

Students are introduced to the Unit Question and the unit context of a water shortage in the fictional city of East Ferris.

Instructional Guide

1. Introduce the unit and project the image of Ferris Island. Let students know they are starting a new unit about water.

This illustration shows Ferris Island and the cities of East and West Ferris on the island. East Ferris has a problem: They do not have enough water. They need our help to solve this problem. East Ferris isn't a real city, but problems with not having enough water are very real for many cities around the world.

Have students briefly share what they notice about the island.

2. Introduce students to their role as water resource engineers.

For this unit, you will take on the role of water resource engineers helping East Ferris with their water problem. You'll get to do many of the things that water resource engineers do.

Classroom Slides, Lesson 1.1

Find the Instructional Guide for Lesson 1.1 in the exemplar Teacher's Guide included in your sample.

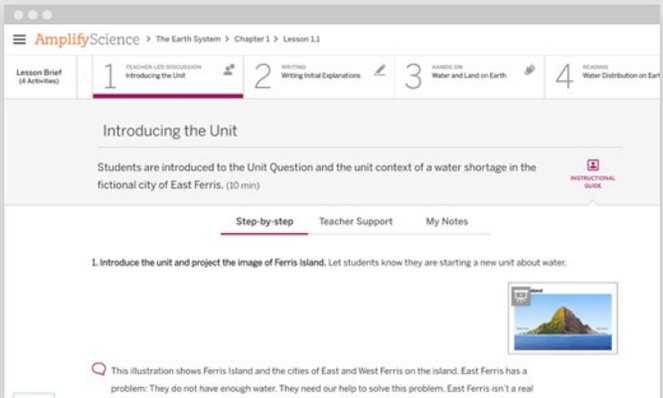
The Instructional Guide contains step-by-step instructions for teachers, including teacher talk and discussion prompts.

In Lesson 1.1, students are introduced to their role as water resource engineers. Students' written explanations reveal their initial understanding of why some areas get more rain than others and how factors like mountain ranges and the wind can affect rainfall.

Students also participate in a hands-on activity, tossing an inflatable globe to observe how often their hands land on water, discovering that water covers the vast majority of Earth's surface.

GO ONLINE

To access the Instructional Guide in the digital Teacher's Guide, click on any activity within a Lesson.



Walkthrough progress PLAN TEACH ASSESS

Teacher sample page: Simulation

Lesson 2.3
Activity 2

The Earth System
Lesson Guides

2 SIM
Exploring The Earth System Simulation

Exploring The Earth System Simulation

15 MIN

Students are introduced to *The Earth System* Simulation and become familiar with its features.

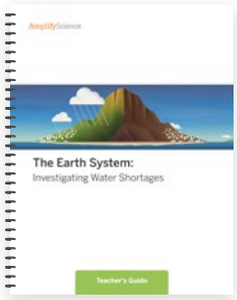
Instructional Guide

1. Introduce *The Earth System* Simulation.

Today, we're going to use a digital simulation, or Sim, to learn more about how raindrops form, both at the observable scale and at the nanoscale. You will have time to explore the Sim in pairs, and you will then use the Sim to observe how raindrops form.

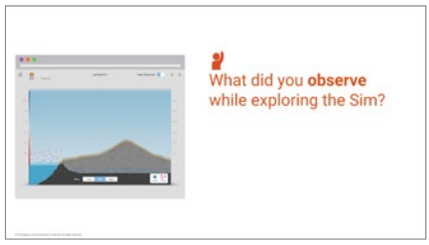
2. Students think about water molecules during condensation. Have students briefly discuss condensation on the nanoscale with their partners.

What do you think happens to water molecules when water vapor condenses into raindrops in the atmosphere?



Turn to the Instructional Guide for Lesson 2.3 in the exemplar Teacher's Guide included in your sample.

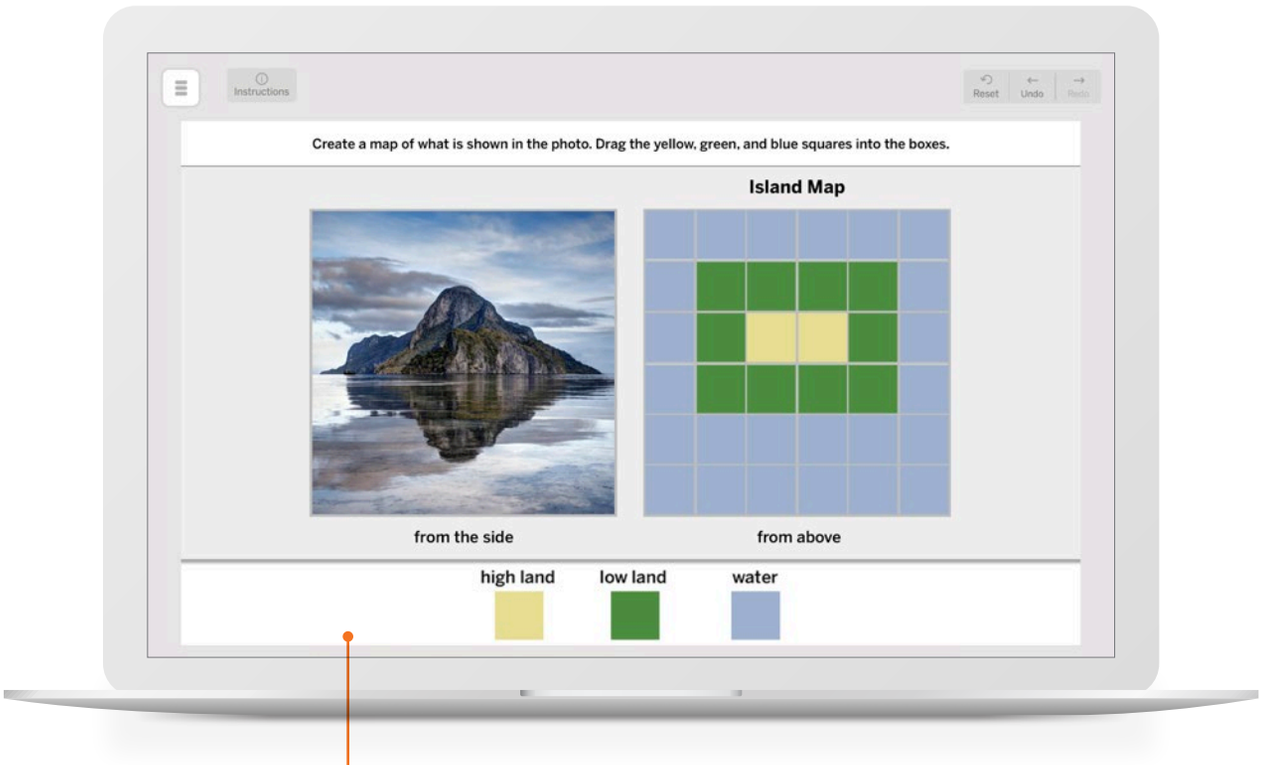
In Lesson 2.3, students have the opportunity to explore the *The Earth System* simulation for the first time and become familiar with its features.



Classroom Slides, Lesson 2.3

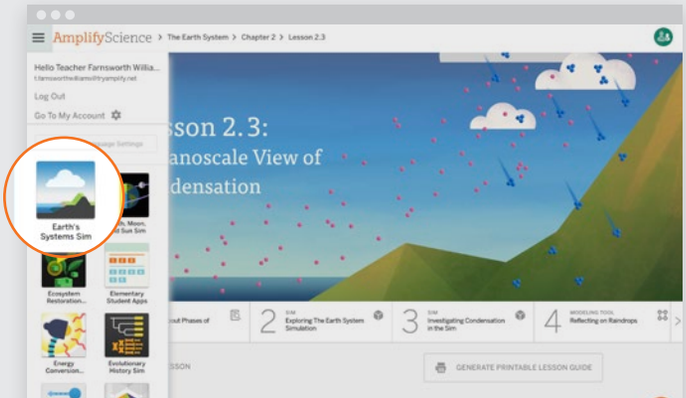
GO ONLINE

Sims are accessible at point-of-use in the digital Teacher's Guide or via the Global Navigation Menu on the left side of the screen.



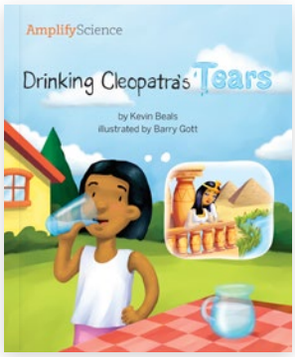
Using the Sim, students continue to investigate what happens at the nanoscale when condensation happens and raindrops form. They reflect on their learning by discussing different examples of condensation.

Students then use the *The Earth System* modeling tool to create a digital model that shows what happens at the nanoscale when water vapor condenses and raindrops form. This activity provides an On-the-Fly Assessment to assess students' understanding of raindrop formation at the nanoscale.



Walkthrough progress PLAN TEACH ASSESS

Student sample page: Student Book



Find the Student Book *Drinking Cleopatra's Tears* in your sample and turn to page 4.

In Lesson 2.5, the teacher introduces the book *Drinking Cleopatra's Tears* and explains ideas students will synthesize as they read. This prepares students to record big ideas during reading.

Students then read the book in pairs and connect ideas from the text to ideas from their hands-on investigations earlier in the chapter when they observed condensation.

Students share the ideas they gather from the book and answer the question: *How can water from Cleopatra's tears be on Earth today?*

Are you washing dishes with a caveman's sweat?

Any time you turn on the tap, you could be getting caveman sweat! The water in the sweat that cave people sweated is still somewhere on Earth, and so is the water in the sweat that any person has ever sweated, including you! Maybe some of the water you wash dishes with was once in a caveman's sweat.

4

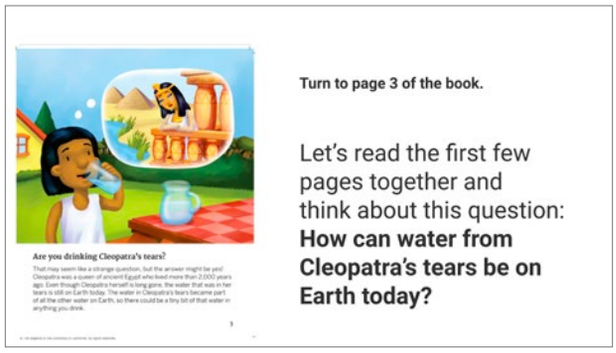
GO ONLINE

Student Books are accessible digitally via the Library in the Global Navigation Menu on the left side of the screen.

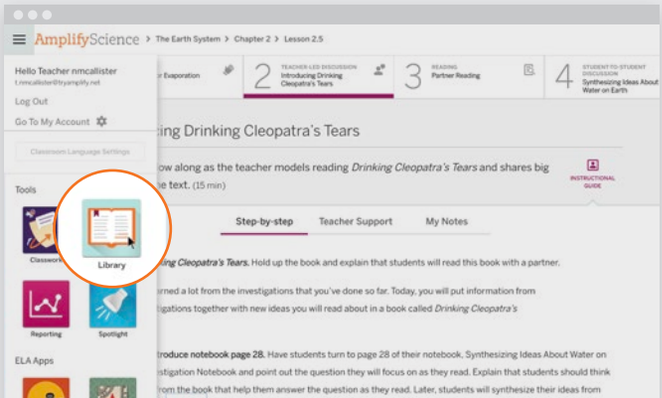
Are you taking a bath in *T. rex* spit?

Next time you take a bath, remember that you might be bathing in spit from an animal that's been extinct for millions of years. The water that was in *T. rex* spit is still around—in fact, all the water that was on Earth millions of years ago is still with us. The water on Earth today is the same water that was here long ago because the water on Earth gets recycled over and over and over and over again—including water that was in *T. rex* spit.

5

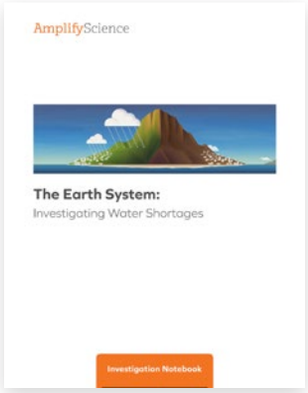


Classroom Slides, Lesson 2.5



Walkthrough progress PLAN TEACH ASSESS

Student sample page: Writing scientific explanations



Turn to page 56 in the *The Earth System* Student Investigation Notebook included in your sample.

In Lesson 3.3, students explore the *The Earth System* modeling tool to express their understanding of where raindrops form in the atmosphere and why.

Students then write scientific explanations to answer the questions *Why does a lot of rain form over West Ferris?* and *Why doesn't much rain form over East Ferris?*

This Critical Juncture writing task is designed to reveal how students' thinking has evolved since they wrote scientific explanations earlier in the unit.

Name: _____ Date: _____

Scientific Explanation of Why It Rains in West Ferris

1. In the box below, write scientific words that you will use in your explanation.
2. Your audience is the people of East Ferris.
3. Write an explanation that answers Question 1 below.
4. Make sure you include what is happening at the nanoscale as part of your explanation.
5. After you have written your explanation for Question 1, answer Question 2 on the next page.

Scientific language

Question 1: Why does a lot of rain form over West Ferris?

56 The Earth System—Lesson 3.3

GO ONLINE

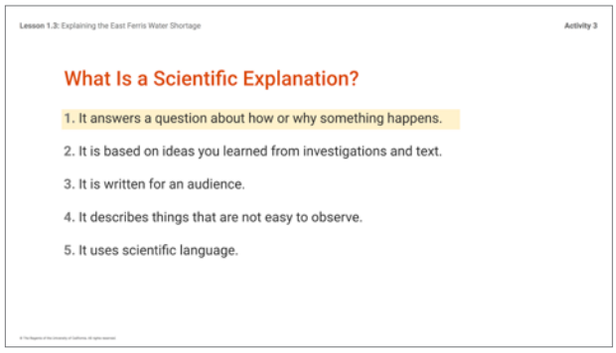
The full Student Investigation Notebook can be accessed digitally from the Unit Guide.

Name: _____ Date: _____

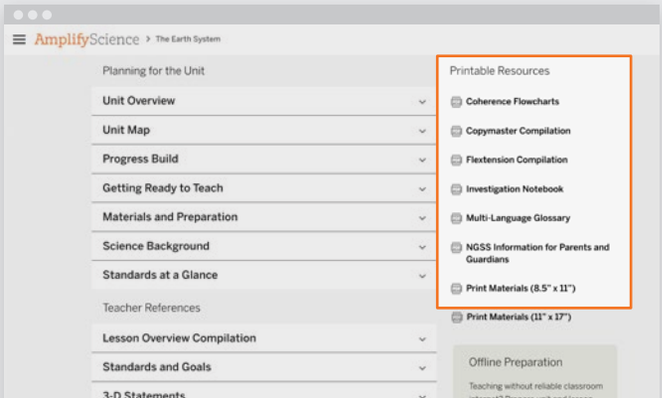
Scientific Explanation of Why It Rains in West Ferris (continued)

Question 2: Why doesn't much rain form over East Ferris?

Make a diagram if it helps you explain your thinking. Label your diagram.

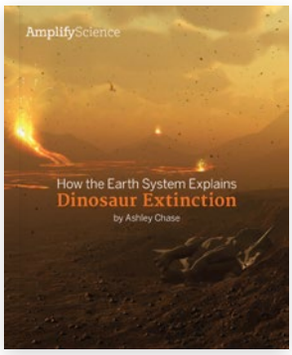


Classroom Slides, Lesson 3.3



Walkthrough progress PLAN TEACH ASSESS

Student sample page: Student Book



Find the *How the Earth System Explains Dinosaur Extinction* Student Book in your sample and turn to page 6.

In Lesson 4.4, students read *How the Earth System Explains Dinosaur Extinction*, which illustrates how Earth is a system of interacting parts, with the purpose of recording big ideas about how Earth functions as a system.

After reading, students discuss their ideas about Earth as a system of interacting parts. Then, they synthesize ideas from the text with ideas from their investigations to think about how the water shortage in East Ferris is an example of Earth system interactions.

The Earth System

What does it mean to say that Earth is a system? To think about Earth as a system, it helps to compare Earth to a system we know well: the human body system. The Earth system is constantly developing and changing, almost like a living person.

In a living body, parts like the heart, stomach, brain, and bones all work together to keep the person alive. The different body parts interact and affect each other. If a disease damages a person's heart, that damage will affect other parts of the body. In fact, it will affect the person's whole body system.

The human body is a system of interacting parts.

6

GO ONLINE

In the Instructional Guide in the digital Teacher's Guide, the Possible Responses tab gives teachers examples of responses students may give to questions and written assignments.

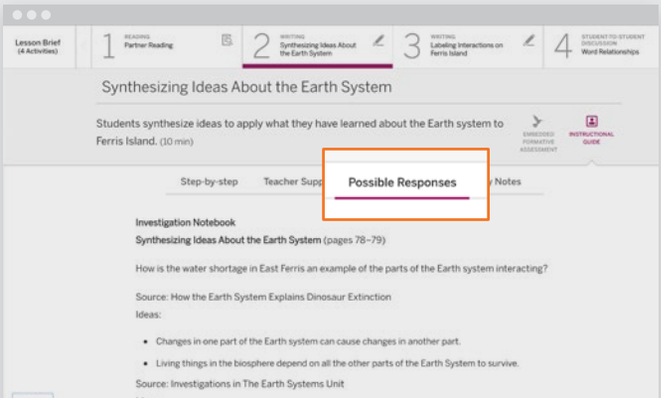
Just like your body, Earth is a system. Like body parts, the parts of the Earth system interact and affect each other. A change to one part will affect the other parts, as well as the whole Earth system.

To explain dinosaur extinction, we need to understand the different parts of the Earth system: the **atmosphere**, the **geosphere**, the **hydrosphere**, and the **biosphere**.

Earth is a system of interacting parts.

7

Classroom Slides, Lesson 4.4



Walkthrough progress PLAN TEACH ASSESS

Teacher sample page: Hands-on activity

The Earth System
Lesson Guides

Lesson 5.1
Activity 2

2 HANDS-ON
Observing Substances

Observing Substances

15 MIN

Students observe the substances they will mix to cause a chemical reaction, then record observations.

Instructional Guide

1. Introduce the Mixing Substances Investigation.

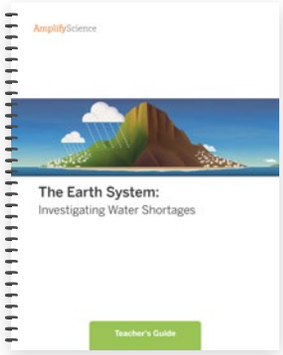
To help us figure out how new substances form, let's do an investigation. We will observe substances and then mix them together to see what happens.

2. Review safety. Refer to page 1, Safety Guidelines for Science Investigations, in the Investigation Notebook to highlight your expectations.

- Focus on Guideline 1: **Follow instructions.** Remind students never to mix any chemicals without permission. Let them know that they will not be mixing substances in the first part of this activity.
- Focus on Guideline 2: **Don't taste things.** Tell students that they will not be tasting *any* substances during this unit.
- Focus on Guideline 3: **Smell substances like a chemist.** Explain that taking a deep whiff of some substances could be dangerous. Demonstrate holding a cup on one of the substances several inches in front of your nose, and wafting the air toward your nose with your hand.
- Focus on Guideline 4: **Protect your eyes.** Let students know that they will be wearing safety goggles during this investigation to ensure that nothing splashes into their eyes.

3. Introduce materials. Show students a tray of materials and explain that these are the substances students will investigate during this lesson and the tools they will use to do so.

- **Tools.** Point out the hand lenses and wooden sticks. Explain that the hand lenses are for close observation. Emphasize that the wooden sticks are not for stirring; they are available to gently move and poke at the baking soda and calcium chloride to observe their properties without touching the substances with their skin.



Turn to the Instructional Guide for Lesson 5.1 in the exemplar Teacher's Guide included in your sample.

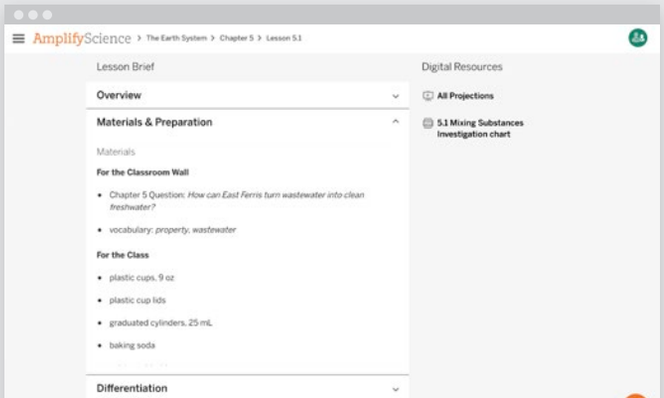
In this activity, students read a new message requesting they look into wastewater treatment as another solution to East Ferris's water problem.

In a hands-on investigation, students mix substances and observe a chemical reaction. A firsthand experience with this chemical reaction provides students with a valuable schema that they will elaborate on in future activities.

After observing the chemical reaction, students share their observations and discuss how the properties of the substances they put into their bags differed from the properties of the substances they ended up with.

GO ONLINE

The Lesson Guide for each lesson includes a Materials & Preparation section, which details materials needed for that lesson and information on how to set up your classroom for the lesson.



Walkthrough progress PLAN TEACH ASSESS

Teacher sample page: End-of-Unit Assessment

The Earth System
Lesson Guides

Lesson 5.5
Activity 3

3 WRITING
End-of-Unit Assessment
Part 2

End-of-Unit Assessment Part 2

30 MIN

Students write an explanation about wastewater treatment to the people of East Ferris. This is the second of two end-of-unit assessments.

Instructional Guide

1. Review the Chapter 5 Question. Remind students they are working to investigate wastewater treatment for Mayor McKnight. Read the chapter question aloud.

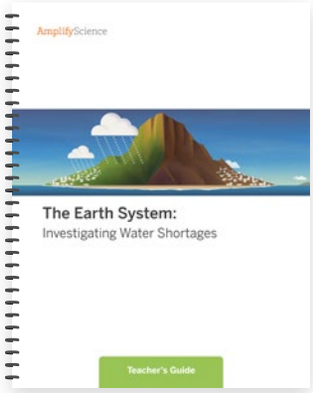
Remember that Mayor McKnight asked us to learn more about wastewater treatment as a possible solution to East Ferris's water shortage problem.

We need to answer the question, *How can East Ferris turn wastewater into clean freshwater?*

2. Remind students of Mayor McKnight's request. Remind students that Mayor McKnight thinks that East Ferris might be able to use wastewater treatment to help solve their water shortage problem.

Mayor McKnight wanted to know how wastewater treatment works because the people of East Ferris aren't sure about the idea of using water that was once wastewater.

Now you are going to write to the people of East Ferris to explain how adding substances to wastewater allows engineers to get rid of harmful substances.



Find the Instructional Guide for Lesson 5.5 in the exemplar Teacher's Guide included in your sample.

After reading the Student Book *Water Encyclopedia* to see a real-world application of what they have learned about chemical reactions, students apply what they learned throughout Chapter 5 to write a scientific explanation of how adding substances to wastewater allows engineers to get rid of harmful substances.

Teachers use rubrics in the Assessment Guide to assess students' final explanations. Rubrics are provided for assessing students' performance of the practice of constructing explanations and their understanding of science ideas encountered in the unit.

GO ONLINE

Navigate to the Lesson Brief for Lesson 5.5 and download the Assessment Guide from the Digital Resources section on the right side of your screen.

Name: _____ Date: _____

End-of-Unit Writing Part 2:
Explaining Wastewater Treatment (continued)

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Name: _____ Date: _____

End-of-Unit Writing Part 2:
Explaining Wastewater Treatment

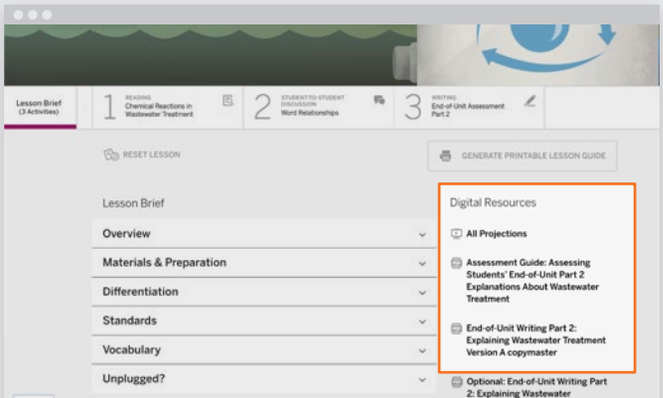
1. In the box below, write scientific words that you will use in your explanation.
2. Your audience is the people of East Ferris.
3. Write an explanation that answers the question on the next page.
4. Make sure you include what is happening at the nanoscale as part of your explanation.

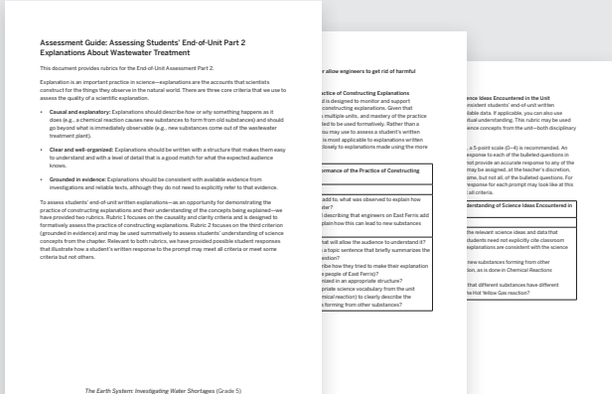
Scientific language

AmplifyScience

The Earth System:
Investigating Water Shortages

Investigation Notebook





Assessment Guide: Assessing Students' End-of-Unit Part 2 Explanations About Wastewater Treatment

This document provides rubrics for the End-of-Unit Assessment Part 2.

Explanation is an important practice in science—explanations are the accounts that scientists construct for the things they observe in the natural world. There are three core criteria that we use to assess the quality of a scientific explanation.

- **Causal and explanatory:** Explanations should describe how or why something happens as it does (e.g., a chemical reaction causes new substances to form from old substances) and should go beyond what is immediately observable (e.g., new substances come out of the wastewater treatment plant).
- **Clear and well-organized:** Explanations should be written with a structure that makes them easy to understand and with a level of detail that is a good match for what the expected audience knows.
- **Grounded in evidence:** Explanations should be consistent with available evidence from investigations and reliable texts, although they do not need to explicitly refer to that evidence.

To assess students' end-of-unit written explanations—as an opportunity for demonstrating the practice of constructing explanations and their understanding of the concepts being explained—we have provided two rubrics. Rubric 1 focuses on the causality and clarity criteria and is designed to formatively assess the practice of constructing explanations. Rubric 2 focuses on the third criterion (grounded in evidence) and may be used summatively to assess students' understanding of science concepts from the chapter. Relevant to both rubrics, we have provided possible student responses that illustrate how a student's written response to the prompt may meet all criteria or meet some criteria but not others.

For more information on Amplify Science, visit **amplify.com/sciencek5**.

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