START HERE

Amplify Science

Grade 7

Instructional sampler

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.

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/science68. A guided tour will familiarize you with navigating the program and its features.

amplify.com/science68

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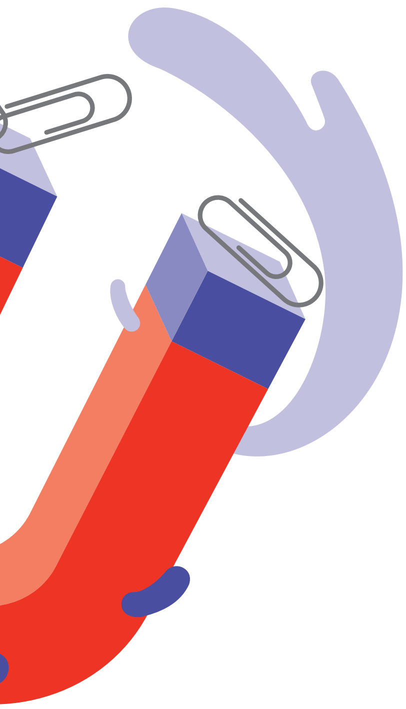
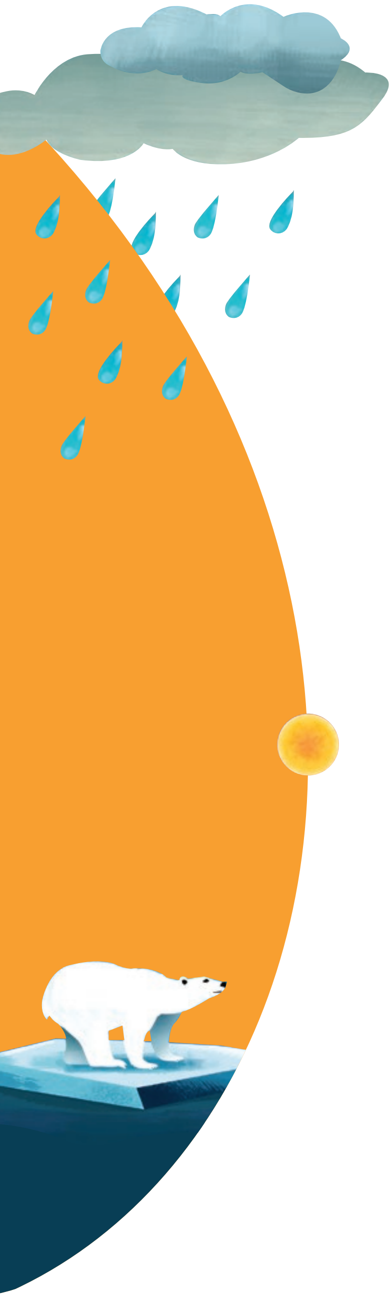




About the program

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.



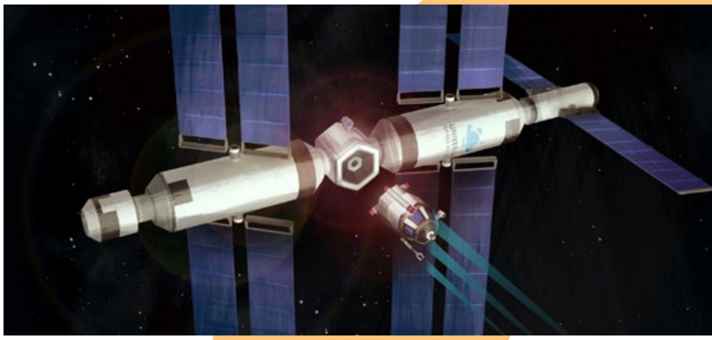


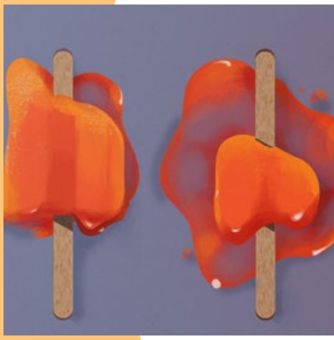

Built for new science standards and three-dimensional learning

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.



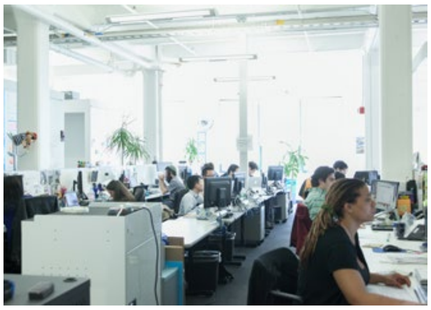


A powerful partnership

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.

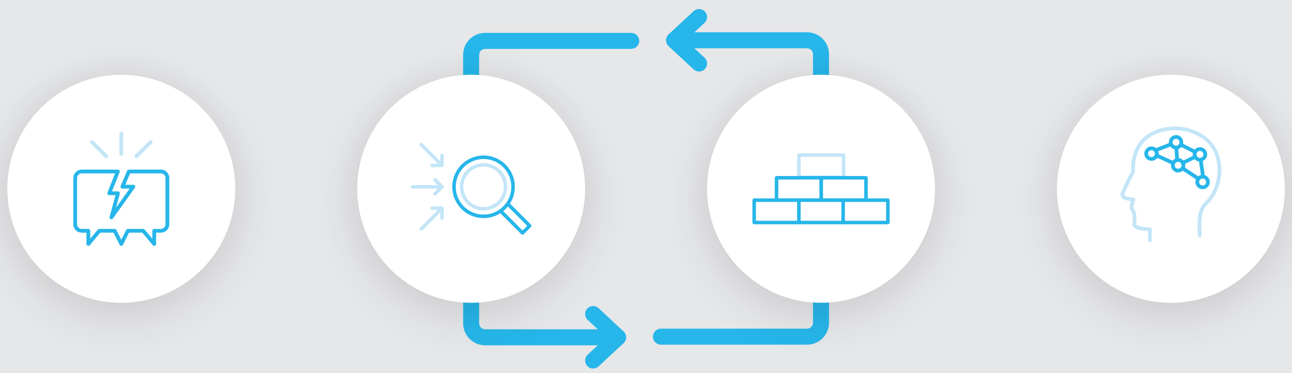
Sincerely,

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

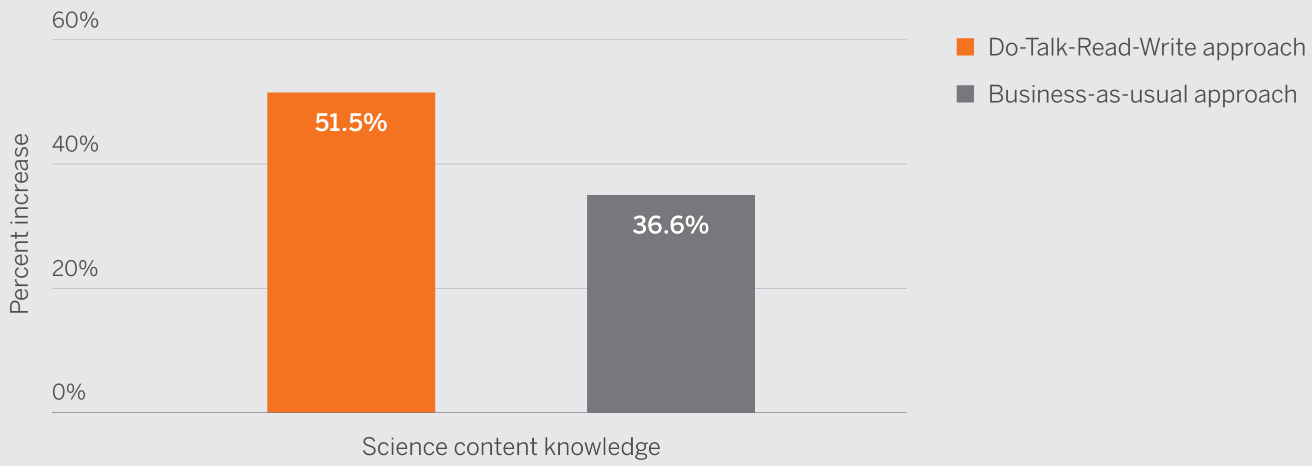
Grounded in research and proven effective

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 6–8: **9**

Unit types

Every Amplify Science unit provides a three-dimensional learning experience. Students will encounter three types of units throughout the course of each year in grades 6–8.

Launch

Launch units introduce students to norms, routines, and practices that will be built on throughout the year.

Core

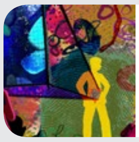
Core units guide students in constructing a deep understanding of science concepts by using key science and engineering practices.

Course structure

Each unit includes two dedicated assessment days.

Key: L Launch C Core E Engineering Internship

Grade 6



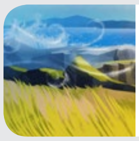
Microbiome
11 lessons L

Metabolism
19 lessons C

Metabolism: Engineering Internship
10 lessons E

Traits and Reproduction
19 lessons C

Thermal Energy
19 lessons C



Ocean, Atmosphere, and Climate
19 lessons C

Weather Patterns
19 lessons C

Earth's Changing Climate
19 lessons C

Earth's Changing Climate: Engineering Internship
10 lessons E

Grade 7

Geology on Mars
11 lessons L

Plate Motion
19 lessons C

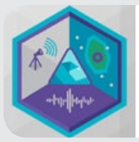


Plate Motion: Engineering Internship
10 lessons E

Rock Transformations
19 lessons C

Phase Change
19 lessons C

Engineering Internship units

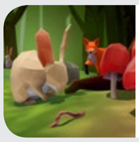
Engineering Internship units have students design solutions for real-world problems that require them to figure out how to help those in need, such as tsunami victims and premature babies, through the application of engineering and design practices.

*Example integrated sequence shown here. Amplify will work with you to design an integrated or domain sequence that will fit the needs of your school or district.


Phase Change: Engineering Internship
10 lessons E


Chemical Reactions
19 lessons C


Populations and Resources
19 lessons C


Matter and Energy in Ecosystems
19 lessons C

Grade 8


Harnessing Human Energy
11 lessons L


Force and Motion
19 lessons C


Force and Motion: Engineering Internship
10 lessons E


Magnetic Fields
19 lessons C


Light Waves
19 lessons C


Earth, Moon, and Sun
19 lessons C


Natural Selection
19 lessons C


Natural Selection: Engineering Internship
10 lessons E


Evolutionary History
19 lessons C

Phenomena and student roles in grades 6–8

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

GRADE 6

Metabolism

What is causing Elisa to feel tired all the time?

Anchor phenomenon: Elisa, a young patient, feels tired all the time.

Through inhabiting the role of medical students in a hospital, students are able to draw connections between the large-scale, macro-level experiences of the body and the micro-level processes that make the body function as they first diagnose a patient and then analyze the metabolism of world-class athletes. They uncover how body systems work together to bring molecules from food and air to the trillions of cells in the human body.

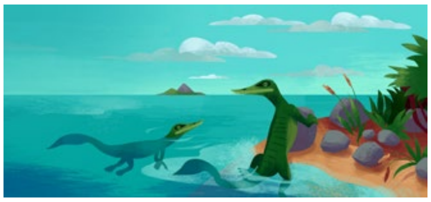
GRADE 6

Traits and Reproduction

Why do Darwin's bark spider offspring have different silk flexibility traits even though they have the same parents?

Anchor phenomenon: Darwin's bark spider offspring have different silk flexibility traits, even though they have the same parents.

Scientists and engineers are investigating possible ways spider silk can be used for medical purposes, such as for artificial tendons. **Students in this unit therefore act as student geneticists helping a fictional biomedical company by investigating what causes variation in spider silk traits.** Specifically, they explain why parent spiders have offspring with widely varied silk flexibility traits. They uncover the roles of proteins and genes and the way that genes are inherited.



GRADE 7

Plate Motion

Why are Mesosaurus fossils separated by thousands of kilometers of ocean when the species once lived all together?

Anchor phenomenon: Mesosaurus fossils have been found on continents separated by thousands of kilometers of ocean, even though the Mesosaurus species once lived all together.

Students play the role of geologists working for the fictional Museum of West Namibia to investigate Mesosaurus fossils found both in southern Africa and in South America. They learn that the surface of the Earth has changed dramatically over the Earth's history, with continents and ocean basins changing shape and arrangement due to the motion of tectonic plates. They also learn that as the Earth's surface changes, fossils that formed together may be split apart.

GO ONLINE

To read about the anchor phenomena and student roles for every Amplify Science unit, visit amplify.com/science68.

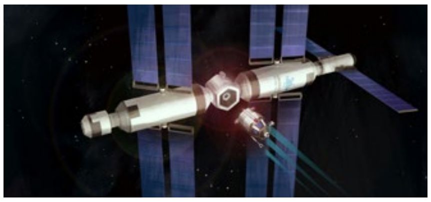
GRADE 7

Phase Change

Why did the methane lake on Titan disappear?

Anchor phenomenon: A methane lake on Titan no longer appears in images taken by a space probe two years apart.

Taking on the role of student chemists working for the fictional Universal Space Agency, students investigate the mystery of a disappearing methane lake on Titan. One team of scientists at the Universal Space Agency claims that the lake evaporated, while the other team of scientists claims that the lake froze. The students' assignment is to determine what happened to the lake. They discover what causes phase changes, including the role of energy transfer and attraction between molecules.



GRADE 8

Force and Motion

What happened in the missing seconds when the space pod should have docked with the space station?

Anchor phenomenon: The asteroid sample–collecting pod failed to dock at the space station as planned.

In the role of student physicists, students help solve a physics mystery in outer space. A pod returning with asteroid samples should have stopped and docked at the space station, but is instead now moving away from the station. The video feed showing what happened in the seconds during which it reversed direction has been lost. Did the pod reverse before it got to the space station, or did it hit the station and bounce off? Students explore principles of force, motion, mass, and collisions as they solve this mystery.

GRADE 8

Earth, Moon, and Sun

How can an astrophotographer plan for the best times to take photos of specific features on the Moon?

Anchor phenomenon: An astrophotographer can only take pictures of specific features on the Moon at certain times.

Students take on the role of student astronomers, advising an astrophotographer who needs to take photographs of the Moon. In order to provide this advice, students investigate where the Moon's light comes from, what causes the characteristic changes in the appearance of the Moon that we observe, and what conditions are required to view phenomena such as particular moon phases and lunar eclipses.

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 6–8 include:

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

Formative

Pre-Unit Assessment

Auto-scored multiple-choice questions and rubric-scored written-response questions.

Formative

On-the-Fly Assessments (OtFAs)

3–4 per chapter; designed to provide regular information with minimal impact on instructional time by leveraging formative opportunities (e.g., student-to-student talk, writing, model construction, etc.). Each On-the-Fly Assessment provides teachers with evidence of how a student is coming to understand core concepts and/or of their developing dexterity with SEPs and CCCs.

End-of-Chapter Explanations

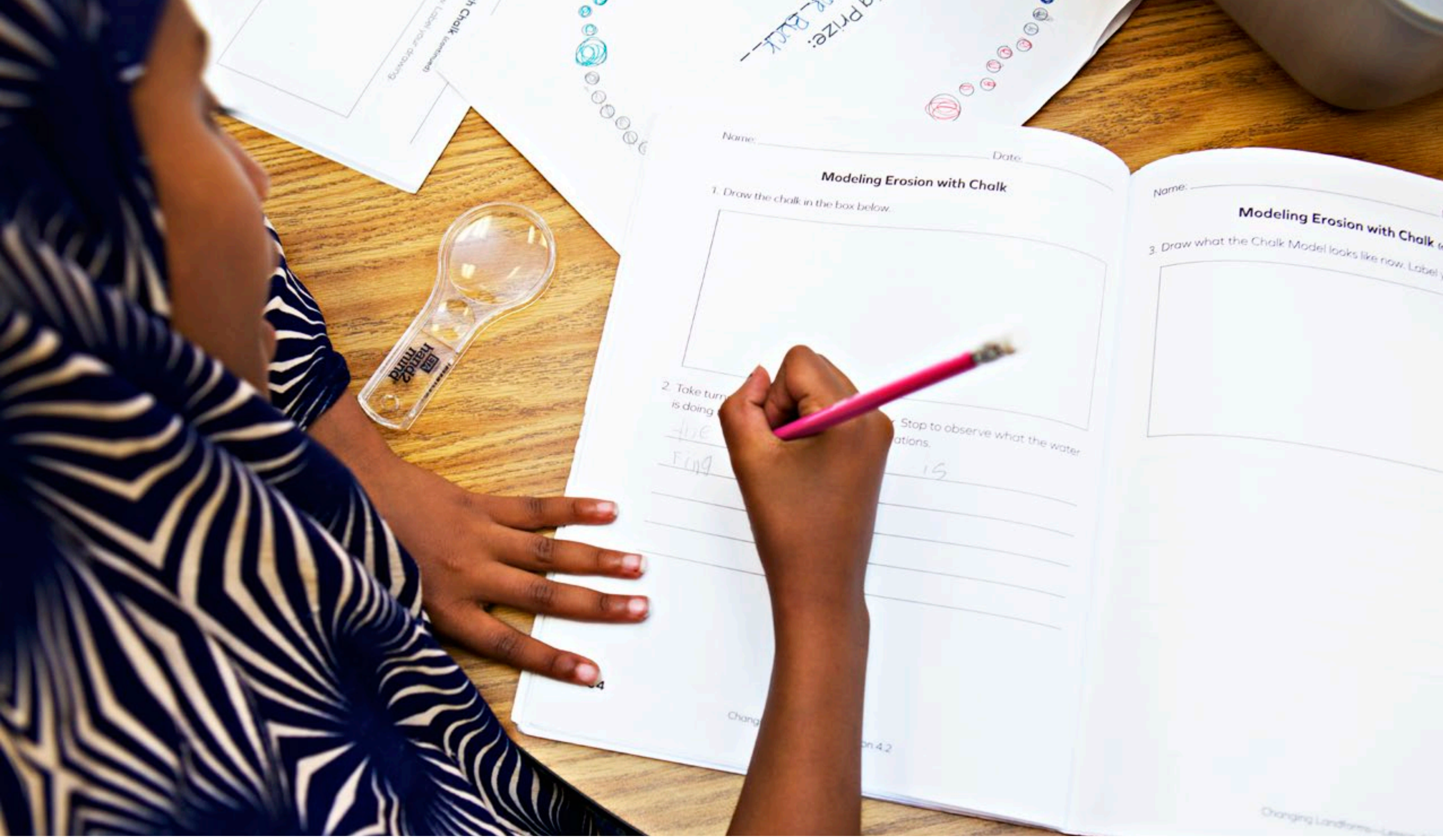
Variety of multidimensional performance tasks, such as writing scientific explanations, developing and using models, and designing engineering solutions, which are intended to assess student progress towards understanding focal concepts of the chapter.

Self-Assessments

One per chapter; to illuminate student thinking and support metacognition, these offer students brief opportunities to reflect on their own learning, to ask questions, and to record ongoing wonderings about unit content.

Critical Juncture Assessment

Occurring toward the midpoint of each unit; auto-scored multiple-choice questions and rubric-scored written-response questions, similar to the Pre-Unit and End-of Unit Assessment. Student performance on the Critical Juncture guides differentiated instruction in the subsequent lesson.



Summative

Science Seminar & Final Written Argument

Culminating performance task for each unit; includes rubrics for assessing core unit concepts as well as students' developing facility with the practice of scientific argumentation.

End-of-Unit Assessment

Auto-scored multiple-choice questions and rubric-scored written-response questions; scored with the same diagnostic model as the Pre-Unit Assessment, which provides a clear way to document student learning outcomes over the course of the 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.

Engaging materials

Hands-on investigations in grades 6–8

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

GRADE 6

Thermal Energy

Investigating Hot and Cold (Lesson 1.2)

In Lesson 1.2 of the *Thermal Energy* unit, students begin thinking about which heating system is better by investigating how something is different when it is warmer or cooler. They add food coloring to a cup of hot water and a cup of cold water to observe how the coloring spreads in each cup. They see that the food coloring spreads faster in warmer water than it does in colder water, which helps them see the connection between temperature and movement and begin to understand temperature in terms of molecular motion.

GRADE 6

Traits and Reproduction

Gathering Evidence About Genes (Lesson 2.2)

In Lesson 2.2 of the *Traits and Reproduction* unit, students gather evidence that will help them figure out how organisms make different protein molecules for a particular feature. Students participate in a model in which printed instructions represent genes and connected K'NEX pieces represent models of protein molecules. Students, playing the roles of ribosomes, follow the instructions in order to construct the protein molecules. By participating in this model, students conclude that each gene version provides a unique instruction to make a specific protein molecule. This activity also reinforces the idea that the genes themselves do not build the protein molecules. Students then receive changes to the instructions and rebuild their molecule models. These new instructions represent mutations, which allows students to see how mutations can result in changes to proteins.

GRADE 7

Plate Motion Engineering Internship

Modeling a Tsunami Wave (Day 2)

In this lesson, students explore tsunami waves through a physical tsunami tank model. Using the model, they compare the effects of normal, wind-driven waves and a tsunami wave caused by underwater plate motion. Students begin by setting up buildings on the shore of the tsunami tank before each test, and then take turns testing how to generate each wave type.

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 7

Populations and Resources

Energy Storage Molecules (Lesson 2.2)

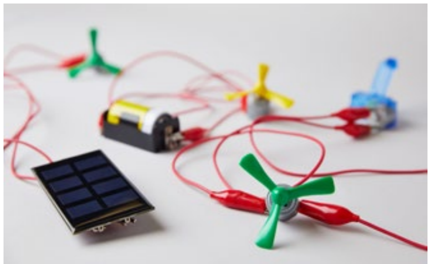
In Lesson 2.2 of *Populations and Resources*, students gain firsthand experience with the relationship between energy storage molecules and an organism's ability to release energy for reproduction. Students give yeast different amounts of sugar (an energy storage molecule). Students observe that the more sugar the yeast gets the more bubbles it produces. Students use this as evidence that the more energy storage molecules organisms have, the more energy they can release for reproduction.

GRADE 8

Force and Motion Engineering Internship

Egg Drop Challenge (Day 2)

In this lesson, students deepen their research of collisions and impact forces by modeling the supply pods with a hands-on activity, the Egg Drop Challenge. Students design and build structures to surround and protect an egg. They weigh their structures and consider the effect of the mass on the impact it will experience. The Egg Drop Challenge spans two days, allowing time for student reflection and iteration.



GRADE 8

Harnessing Human Energy

Investigating Energy Systems (Lesson 1.2)

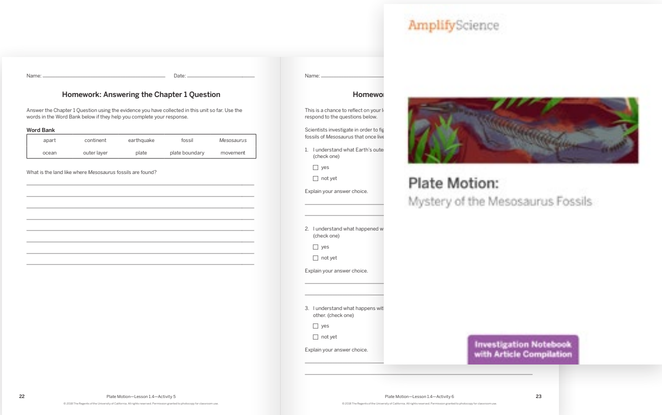
In Lesson 1.2 of *Harnessing Human Energy*, students conduct a hands-on investigation to answer the Investigation Question: *How do you know something has energy?* To do this, students build three systems that use, respectively, a hand-crank generator, a battery, and a solar cell to make a fan spin and gather evidence about whether each system has energy.

GO ONLINE

For a complete materials list and to see more example activities, visit amplify.com/science68.

Student Investigation Notebooks and science articles

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.



Students can either interact with lesson content online or use these Investigation Notebooks, which are available in print from Amplify, to access the same information offline.

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

PDF files of individual pages of the Investigation Notebook can be downloaded at point-of-use at the lesson level in the digital Teacher's Guide.

Printable Resources

- **Coherence Flowcharts**
- **Copymaster Compilation**
- **Investigation Notebook**
- **Multi-Language Glossary**

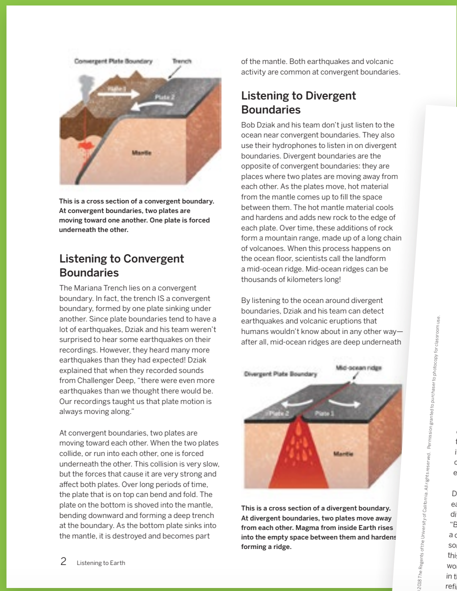
SPANISH LANGUAGE SUPPORT

All Student Investigation Notebooks are also available in Spanish.

Listening to Earth

Bob Dziak is a scientist who studies sound in the ocean.

This diagram shows how sound travels around deep trenches like the Mariana Trench. Here, sound is represented by red and yellow lines. If the source of a sound is directly over the trench, like it is in the middle panel, sound will easily travel into the deepest parts of the trench. However, if the source of the sound is not directly over the trench, most of the sound does not make it to the bottom of the trench.



Listening to Convergent Boundaries

Listening to Divergent Boundaries

This is a cross section of a convergent boundary. At convergent boundaries, two plates are moving toward one another. One plate is forced underneath the other.

This is a cross section of a divergent boundary. At divergent boundaries, two plates move away from each other. Magma from inside Earth rises into the empty space between them and hardens forming a ridge.

This person is pulling a hydrophone out of the deep ocean, where it's been recording sound.

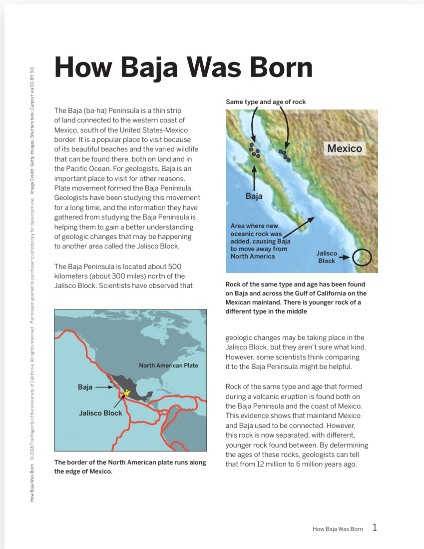
Putting It All Together

Each Amplify Science unit includes multiple student articles, which are custom-written by the Lawrence Hall of Science.

These informational texts are designed to support students' understanding of science ideas, practices, and crosscutting concepts, as well as to showcase the work of diverse scientists.

An important goal of the Amplify Science program is to provide appropriately complex science texts for students that support, link to, and expand their firsthand science learning. To accomplish this goal, the Lawrence Hall of Science made sure that the articles, as well as the instruction surrounding them, would be accessible to as many students as possible.

The placement of each article within the instructional sequence was strategically designed (and classroom-tested!), to ensure the text would be supportive of student content learning in a variety of ways, and would provide just-in-time information that reinforces or introduces key ideas. The texts also include carefully created and/or selected visual representations such as diagrams, photographs, and illustrations that support and/or provide additional information.



How Baja Was Born

Rock of the same type and age has been found on Baja and across the Gulf of California on the Mexican mainland. There is younger rock of a different type in the middle

The border of the North American plate runs along the edge of Mexico.

GO ONLINE

To view full Student Investigation Notebooks for middle school units, begin your review at amplify.com/science68.

Digital resources

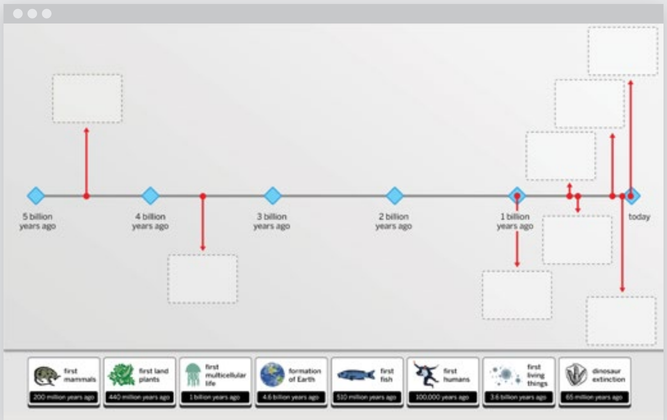
Amplify Science integrates technology thoughtfully and intentionally, not in a "tech for tech's sake" fashion, but in ways that reflect how 21st-century scientists and engineers use it. Teaching students to think and act like modern scientists and engineers requires regular opportunities for students to use state-of-the-art digital tools in addition to reading scientific texts, writing and discussing scientific arguments, and engaging in hands-on learning.

Videos

Videos appear in approximately two to four lessons per unit across grades 6–8. Teachers project the videos to students. Students can access the videos, but are not instructed to do so while in class. Videos open each unit, introducing students to their scientist or engineer roles and to the overarching, real-world, 21st-century problem they will be investigating over the course of the unit. Videos also explore certain topics in greater depth or teach students how to use a certain tool.

Modeling Tools

A collection of unit-specific digital apps, Modeling Tools aid students with modeling and visualizing information in certain units across grades 6–8.

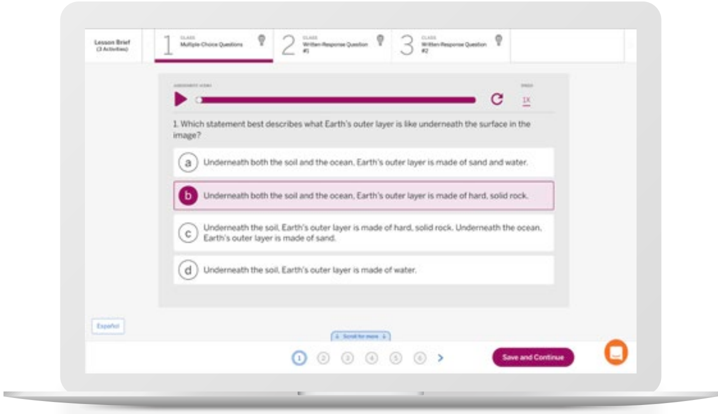


Sorting Tool

Assessments

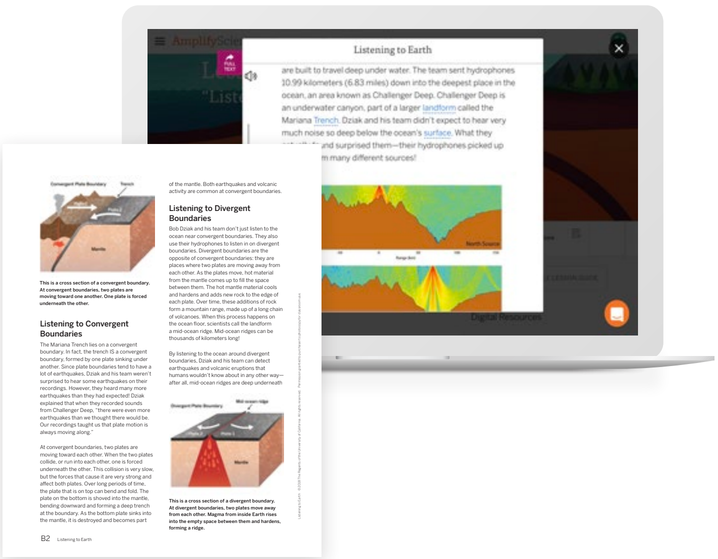
There are a variety of assessments, both formative and summative, embedded in every unit of Amplify Science 6–8. This includes a Pre-Unit, Mid-Unit (or "Critical Juncture"), and End-of-Unit Assessment, each of which consists of a series of 10–20 multiple-choice questions and/or several open-response written questions.

Students can take the Pre-Unit, Critical Juncture, and End-of-Unit Assessments offline via downloadable PDF handouts, or online. When students are able to take these assessments digitally, teachers have immediate access to their autoscored multiple-choice responses, as well as a Reporting feature that helps teachers gain insight into the progress and growth of each of their classes and students.



Science articles

Articles are available both online and off for both students and teachers. The articles can be downloaded as PDFs from the digital Teacher's Guide, and are also included in the print Student Investigation Notebooks. When accessing the articles online, students can copy/paste and highlight content in five different colors, add annotations, and look up in-context definitions of vocabulary words in English and Spanish. They also have the ability to hand in any highlight and notes they made to the teacher.



Digital simulations

All middle school units in Amplify Science 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.

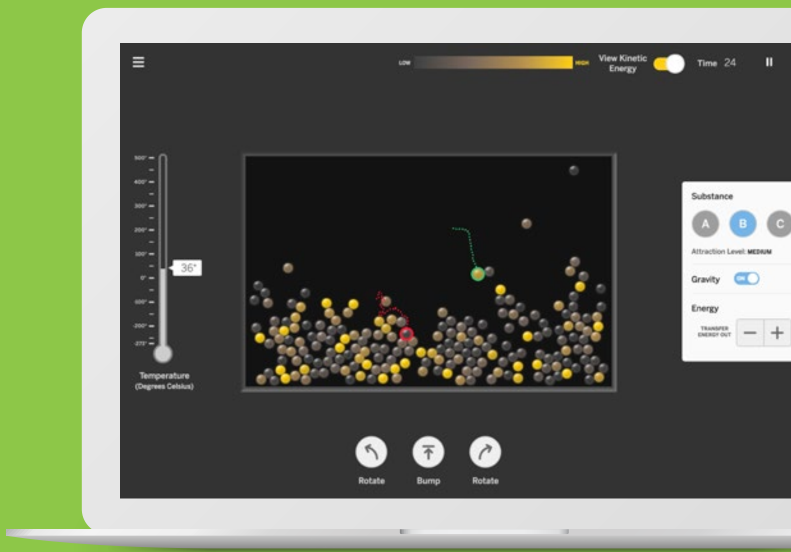
Much like real scientists do, students will use these computer simulations to gain insight into processes that occur on the microscopic scale, or to speed up processes that might otherwise take thousands or millions of years to observe.

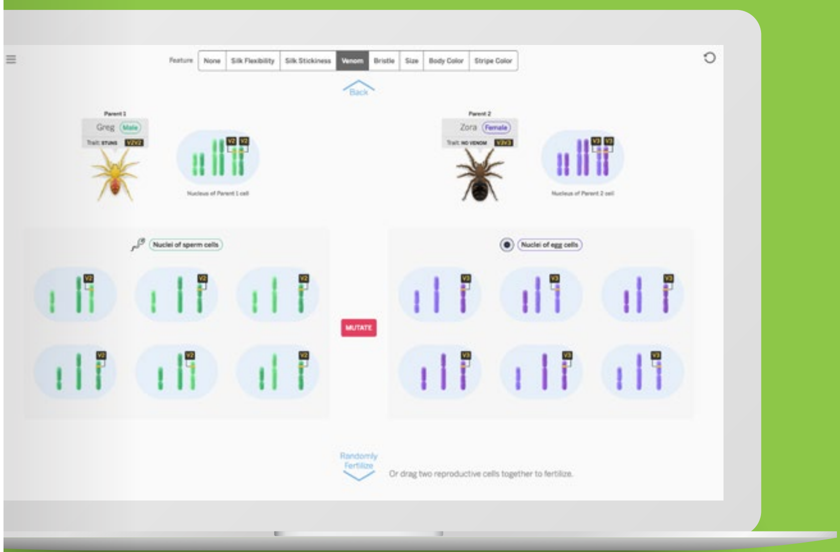
Simulations are just one of several components teachers will use to teach a given scientific concept. The same concepts will be explored through hands-on activities, articles written for the unit, classroom discussions, and more. Each of these tools and techniques gives every student multiple opportunities and modalities through which to explore and ultimately figure out the scientific concept.


Show Beam
Show Energy
INSPECT
INSPECT


LIVE
OSTRILOPE
Status
Looking for food
Traits


Test Results:
BABY'S AVERAGE TEMPERATURE
36.8°C
TIME OUTSIDE HEALTHY RANGE
179 min
TOTAL COST
$ 83
Temperature Over Time


View Kinetic Energy
Time 24
Temperature (Degrees Celsius)
Substance
Gravity
Energy
Rotate
Bump
Rotate


MUTATE
Or drag two reproductive cells together to fertilize.


BUILD
RUN
ANALYZE
0.0 km
34 kg
15 °C

Teacher's Guides

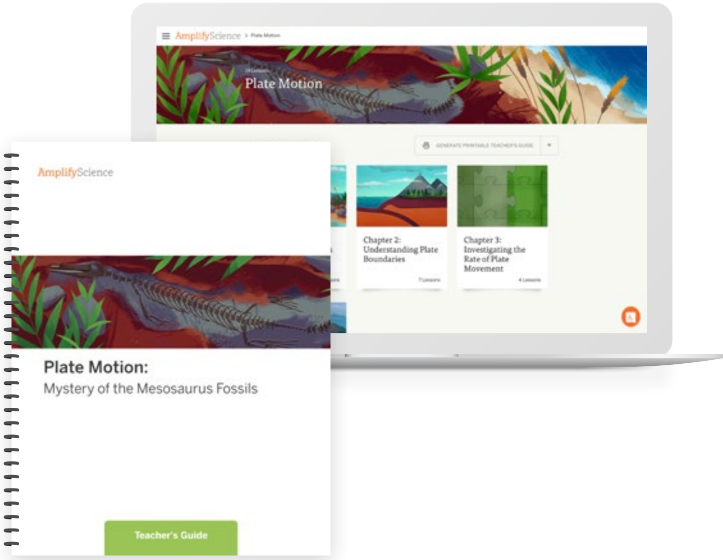
Every unit of Amplify Science includes a comprehensive Teacher's Guide containing lesson plans, differentiation strategies, and other instructional supports and resources at the unit, lesson, and individual activity levels.

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.



ñ 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/science68.

Deliver instruction

Students learn best when they know what to expect. Likewise, teachers teach best when they know what's coming next! That's why we make preparing for and delivering three-dimensional science instruction easy with a variety of embedded supports.

Every print and digital Teacher's Guide contains:

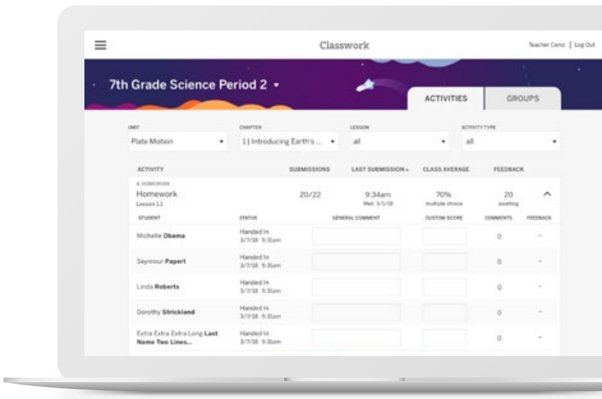
- Unit overviews and lesson briefs
- Detailed lesson preparation notes
- Step-by-step instructions with suggested teacher talk and expected student responses
- Suggested modifications to customize lessons for different settings and students

Some of the many other types of teacher supports included are:

- Color-coded 3-D Statements for every lesson
- Science background information
- Implementation support videos
- A help desk ready to respond to questions as they arise

Classwork

Classwork is a clean and organized online grading system that helps teachers spend less time looking for assignments and more time focusing on reviewing work in order to identify areas of growth, progress toward standards mastery, and strategies for differentiating instruction and offering additional support.



With Classwork, teachers have quick and easy access to:

- Unreviewed work
- Student portfolios
- Automatically generated differentiation groups
- Individual and class-level reports

In your classroom

IN YOUR CLASSROOM

Grade 7: Year at a glance

Grade 7 in Amplify Science contains nine units: one launch unit containing 11 lessons, six core units containing 19 lessons, and two Engineering Internships containing 10 lessons. All lessons are designed for 45 minutes of instruction.

Launch: Geology on Mars

11 Lessons

11 45-minute lessons

In the *Geology on Mars* unit, students observe satellite images and Mars rover data as they consider what may have formed a long channel on the surface of Mars.

Student role and phenomena
In their role as student planetary geologists, students investigate whether a particular channel on Mars was caused by flowing water or flowing lava.

Focal NGSS Performance Expectations:
MS-ESS1-3 • MS-ESS2-2

Focal Disciplinary Core Ideas:
ESS1.B • ESS2.A • ESS2.C

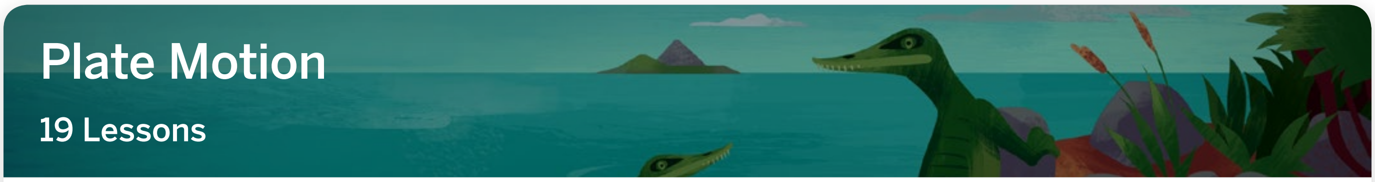


Plate Motion

19 Lessons

16 45-minute lessons | 3 dedicated assessment days

In the *Plate Motion: Mystery of the Mesosaurus Fossils* unit, students investigate plates, what happens at plate boundaries, and at what rate changes happen on a geologic scale.

Student role and phenomena
In the role of student geologists working for the fictional Museum of West Namibia, students will investigate a fossil mystery: why are fossils of Mesosaurus, a population of extinct reptiles that once lived all together, now found separated by thousands of kilometers of ocean?

Focal NGSS Performance Expectations:
MS-ESS1-4 • MS-ESS2-2
MS-ESS2-3

Focal Disciplinary Core Ideas:
ESS1.C • ESS2.A • ESS2.B

Engineering Internship: Plate Motion

10 Lessons

10 45-minute lessons

In the *Plate Motion Engineering Internship: Tsunami Warning Systems* unit, students will consider the design problem of how to protect people from natural hazards.

Student role and phenomena
Students work as geohazard engineering interns at Futura Engineering, where they are tasked with designing a tsunami warning system along the plate boundaries in the Indian Ocean region.

Focal NGSS Performance Expectations:
MS-ETS1-1 • MS-ETS1-2 • MS-ETS1-3
MS-ETS1-4 • MS-ESS3-2

Focal Disciplinary Core Ideas:
ETS1.A • ETS1.B • ETS1.C • ESS3.B

Rock Transformations

19 Lessons

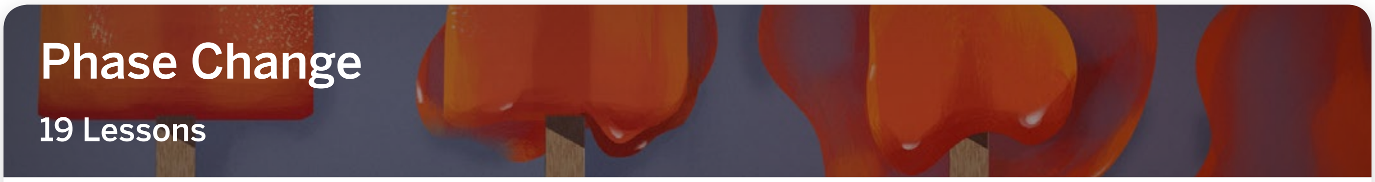
16 45-minute lessons | 3 dedicated assessment days

In the *Rock Transformations: Geologic Puzzle of the Rockies and Great Plains* unit, students develop an understanding of rock transformation processes to explain how rock material from the Rocky Mountains eventually became part of the Great Plains.

Student role and phenomena
In this unit, students play the role of student geologists as they investigate different ways rocks form and change in the Rocky Mountains and Great Plains, two iconic locations in the United States that have a shared geologic history.

Focal NGSS Performance Expectations:
MS-ESS2-1 • MS-ESS2-2
MS-ESS3-1

Focal Disciplinary Core Ideas:
ESS2.A • ESS2.C • ESS3.A • ESS3.C



Phase Change

19 Lessons

16 45-minute lessons | 3 dedicated assessment days

In the *Phase Change: Titan's Disappearing Lakes* unit, students develop an understanding of molecules, kinetic energy, and attraction, as well as evidence about the conditions on Titan, to explain what they think happened to Titan's mysterious lake.

Student role and phenomena
Taking on the role of student chemists working for the fictional Universal Space Agency, students investigate the mystery of the methane lake on Titan. One team of scientists at the Universal Space Agency claims that the lake evaporated while the other team of scientists claims that the lake froze.

Focal NGSS Performance Expectations:
MS-PS1-1 • MS-PS1-4

Focal Disciplinary Core Ideas:
PS1.A

Engineering Internship: Phase Change

10 Lessons

10 45-minute lessons

In the *Phase Change Engineering Internship: Portable Baby Incubators* unit, students apply what they learned in the Phase Change unit to design a device that could potentially save thousands of newborns each year.

Student role and phenomena
Students play the role of chemical engineering interns at Futura Engineering., where they consider the design problem of how to create an incubator that considers three criteria: (1) keeping the baby's average temperature close to 37°C, (2) minimizing the time outside the healthy temperature range, and (3) keeping costs low.

Focal NGSS Performance Expectations:
MS-ETS1-1 • MS-ETS1-2
MS-ETS1-3 • MS-ETS1-4

Focal Disciplinary Core Ideas:
ETS1.A • ETS1.B • ETS1.C

Chemical Reactions

19 Lessons

16 45-minute lessons | 3 dedicated assessment days

In the *Chemical Reactions: Mysterious Substance in Westfield's Weather* unit, students learn about chemical reactions, what makes substances different, and the conservation of matter to solve mysteries.

Student role and phenomena
In this unit, students take on the role of student chemists to solve a mystery that can only be solved with an understanding of fundamental chemical principles: why is there a reddish-brown substance coming out of the water pipes in a neighborhood that gets its water from a well?

Focal NGSS Performance Expectations:
MS-PS1-1 • MS-PS1-2 • MS-PS1-3
MS-PS1-5 • MS-PS1-6

Focal Disciplinary Core Ideas:
PS1.A • PS1.B

Populations and Resources

19 Lessons

16 45-minute lessons | 3 dedicated assessment days

In the *Populations and Resources: Too Many Moon Jellies* unit, students learn how different populations are connected to one another as part of a food web, a key to understanding how changes in one population may affect change in another.

Student role and phenomena
In the role of student ecologists at a research center near the fictional Glacier Sea, students investigate what may have caused a puzzling increase in the size of the moon jelly population there.

Focal NGSS Performance Expectations:
MS-LS2-1 · MS-LS2-2 · MS-LS2-3
MS- LS2-4 · MS-LS2-5

Focal Disciplinary Core Ideas:
LS2.A · LS2.B · LS2.C · LS4.D

Matter and Energy in Ecosystems

19 Lessons

16 45-minute lessons | 3 dedicated assessment days

In the *Matter and Energy in Ecosystems: Biodome Collapse* unit, students expand their understanding of ecosystems by considering both living and nonliving components—how its producers, consumers, and decomposers meet their energy needs.

Student role and phenomena
In the role of student ecologists, students investigate a fictional failed biodome that was set up by a group who hope to live in space someday. Five years into the project, the plants and animals were not getting the resources they needed to release energy, and the ecosystem appeared to be failing. Students work to solve the mystery of what caused the crash.

Focal NGSS Performance Expectations:
LS1-6 · LS1-7 · LS2-2
LS2-3 · LS2-4

Focal Disciplinary Core Ideas:
LS1.C · LS2.A · LS2.B
LS2.C · PS3.D

Deep dive: Plate Motion

Take a closer look at the lessons and activities in the "Plate Motion" unit.

CHAPTER 1 – DAY 1
Lesson 1.1
Pre-Unit Assessment

DAY 2
Lesson 1.2
Using Fossils to Understand Earth

DAY 3
Lesson 1.3
Exploring Earth's Plates

DAY 6
Lesson 2.2
"Listening to Earth"

DAY 7
Lesson 2.3
Explaining Plate-Mantle Interactions

DAY 8
Lesson 2.4
Modeling Plate-Mantle Interactions

DAY 11
Lesson 2.7
Exploring Iceland's Plate Boundary

CHAPTER 3 – DAY 12
Lesson 3.1
Considering Rates of Plate Movement

DAY 13
Lesson 3.2
"A Continental Puzzle"

CHAPTER 4 – DAY 16
Lesson 4.1
Plate Motion Near Jalisco, Mexico

DAY 17
Lesson 4.2
Participating in a Science Seminar

DAY 18
Lesson 4.3
Writing a Scientific Argument

DAY 4

Lesson 1.4
Analyzing Patterns at Plate Boundaries

CHAPTER 2 – DAY 5

Lesson 2.1
Considering What's Underneath Earth's Plates

DAY 9

Lesson 2.5
Identifying Plate Motion at a Plate Boundary

DAY 10

Lesson 2.6
Critical Juncture Assessment

DAY 14

Lesson 3.3
Reconstructing Gondwanaland

DAY 15

Lesson 3.4
Writing About Mesosaurus

DAY 19

Lesson 4.4
End-of-Unit Assessment

Lesson includes a reading activity with science articles

Lesson includes a hands-on investigation

Lesson includes scientific writing activity

Lesson includes use of digital modeling tools or Simulations

Dedicated assessment day

Lesson includes a discussion activity

Unit storyline: Plate Motion

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

The foundational work for the theory of plate tectonics originated in work done by climatologists who were curious about why the fossil record revealed evidence of organisms, such as tropical ferns, in now-frigid places like Antarctica. The work of Alfred Wegener and other scientists combined to create a model of Earth's crust and interior that could explain continental movement on a colossal scale and over eons of time.

With the emergence of new tools, such as GPS, geologists continue to refine their understanding of Earth and the dynamic tectonic processes that still shape it today. In the role of geologists working for the fictional Museum of West Namibia, students investigate a fossil mystery: why are fossils of *Mesosaurus*, a population of extinct reptiles that once lived all together, now found separated by thousands of kilometers of ocean? This mystery serves as the anchor phenomenon, prompting students to understand plates, what happens at plate boundaries, and at what rate changes happen on a geologic scale.

After determining that there is a plate boundary between these groups of fossils, students determine whether the fossils were separated suddenly as a result of one geologic event, or slowly over millions of years. Students explore plates and plate boundaries through a series of hands-on investigations, engaging articles and videos featuring real-life scientists, and the Plate Motion Simulation, which empowers students to create continents, set plates in motion, and observe what happens.This allows them to see in cross section how the plates and mantle interact at convergent and divergent plate boundaries, observe what geologic events occur when plates move, and investigate what types of landforms form due to different types of plate motion.

By the end of the unit, students are able to explain that plates are destroyed and rock is added to plates constantly and slowly (and these processes have been occurring for millions of years) due to large-scale plate movement.

IN YOUR CLASSROOM

Sample unit walkthrough

Walkthrough progress PLAN TEACH ASSESS

Teacher sample page: Unit Overview

Unit Overview

Plate Motion
Planning for the Unit

Unit Overview

What's in This Unit?

The foundational work for the theory of plate tectonics originated in work done by climatologists who were curious about why the fossil record revealed evidence of organisms, such as tropical ferns, in now-frigid places like Antarctica. The work of Alfred Wegener and other scientists combined to create a model of Earth's crust and interior that could explain continental movement on a colossal scale and over eons of time. With the emergence of new tools, such as GPS, geologists continue to refine their understanding of Earth and the dynamic tectonic processes that still shape it today. In the role of geologists working for the fictional Museum of West Namibia, your students will investigate a fossil mystery: why are fossils of *Mesosaurus*, a population of extinct reptile that once lived all together, now found separated by thousands of kilometers of ocean? This mystery serves as the anchor phenomenon for the unit and frames the unit on plate motion, prompting students to understand plates, what happens at plate boundaries, and at what rate changes happen on a geologic scale. After determining that there is a plate boundary between these groups of fossils, students determine whether the fossils were separated suddenly as a result of one geologic event, or slowly over millions of years. Students explore plates and plate boundaries through a series of hands-on investigations and engaging articles and videos featuring real-life scientists. Using the *Plate Motion* Simulation, students create continents, set plates in motion, and watch what happens. This allows them to see in cross section how the plates and mantle interact at convergent and divergent plate boundaries, observe what geologic events occur when plates move, and investigate what types of landforms form due to different types of plate motion. By the end of the unit, students are able to explain that plates are destroyed and rock is added to plates constantly and slowly (and these processes have been occurring for millions of years) due to large-scale plate movement.

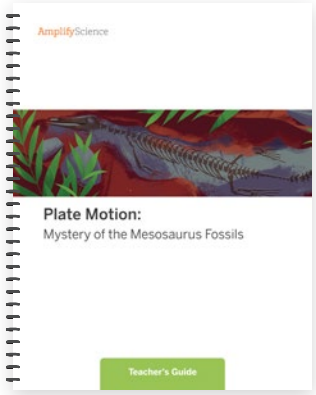
Why?

We chose the context of solving the *Mesosaurus* fossil mystery to investigate plate motion for several reasons. First, considering fossils provides an authentic reason for students to dive deeply into examining ancient evidence of plate movement. The investigation of plate motion as an explanation for the relocation of the fossils over millions of years builds a foundation for students to work more deeply with plate tectonics—a unifying theory within Earth science. Investigating a group of fossils now separated by 4,000 km of ocean also requires students to confront and alter possible misconceptions about the ocean floor. Finally, investigating this mystery in the context of advising a museum about an exhibit provides students with a concrete motivation for learning.

How?

At the beginning of the *Plate Motion* unit, students are introduced to the fictional lead curator of the Museum of West Namibia, Dr. Bayard Moraga. Dr. Moraga calls upon students to investigate the evidence and craft an explanation of the *Mesosaurus* mystery to help museum workers create a *Mesosaurus* exhibit. The mystery of how fossils of species that once lived together are now found in different locations on Earth is broken down into smaller parts.

In Chapter 1, students work to answer the question *What is the land like where* Mesosaurus *fossils are found?* Students have an opportunity to work with the concept of patterns as they interpret evidence across scientific drilling sites all over Earth's surface, using maps and cross sections, which are key visual representations of data in Earth science. They first learn that Earth is covered with hard, solid rock that is divided into plates. Next, they investigate whether there is a consistent pattern to the distribution of earthquakes across the planet. Using evidence from maps and the *Plate Motion* Simulation, students are able to conclude that earthquakes are evidence of plate motion, and that they often occur at or near plate boundaries.

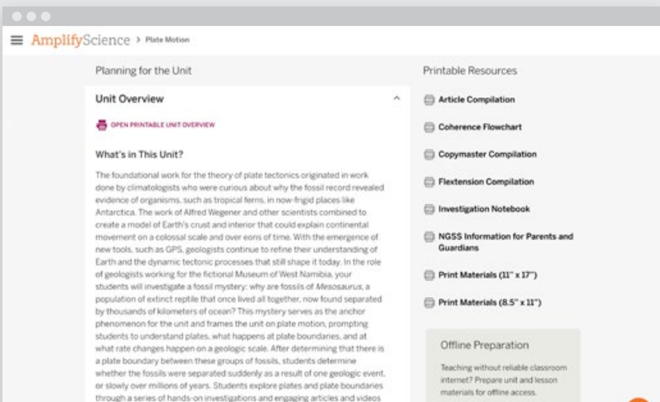


Find the Unit Overview in the exemplar Teacher's Guide included in your sample.

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

Unit Map

Plate Motion
Planning for the Unit

Unit Map

Why are fossils of *Mesosaurus* separated by thousands of kilometers of ocean when the species once lived all together?

Students play the role of geologists working for the fictional Museum of West Namibia to investigate *Mesosaurus* fossils found both in southern Africa and in South America. They learn that the surface of the Earth has changed dramatically over the Earth's history, with continents and ocean basins changing shape and arrangement due to the motion of tectonic plates. As the Earth's surface changes, fossils that formed together may be split apart.

Chapter 1: What is the land like where *Mesosaurus* fossils are found?

Students figure out: The *Mesosaurus* fossils are found in hard, solid rock on two different plates of Earth's surface: the South American and African plates. Earth's outer layer is made of hard, solid rock, and divided into sections called plates. Geologists look for patterns in landforms and in geologic events in order to better understand Earth. The plates of Earth's outer layer move.

How they figure it out: They read a short article about the *Mesosaurus*. They explore the *Plate Motion* Simulation, and interpret evidence in cross sections and maps, including earthquake maps. They test the relationship between earthquakes and plate motion in the Sim and create visual models of their understanding so far.

Chapter 2: How did the South American Plate and African Plate move?

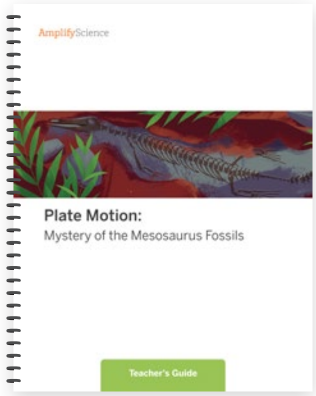
Students figure out: The South American and African plates moved apart as a divergent boundary formed between them and an ocean basin formed and spread. Earth's plates move on top of a soft, solid layer of rock called the mantle. At divergent plate boundaries, rock rises from the mantle and hardens, adding new solid rock to the edges of both plates. At convergent plate boundaries, one plate moves underneath the other plate and sinks into the mantle.

How they figure it out: They examine the properties of soft and hard materials to understand how the soft, solid mantle can allow plates to move over it. They further investigate how plate motion occurs using the Sim and a physical model, and by reading an article about a scientist who gathers evidence about plate motion using sound. Students create visual models of plate motion. They read about plate boundaries in Iceland and Chile.

Chapter 3: How did the *Mesosaurus* fossils on the South American Plate and African Plate get so far apart?

Students figure out: The *Mesosaurus* fossils moved apart gradually over tens of millions of years. Earth's plates travel at a rate too slow to be experienced by humans. It takes a long time for Earth's plates to travel great distances.

How they figure it out: They analyze GPS data and test the rate of plate motion in the Sim. They read about Alfred Wegener's investigation of fossils and how he developed the first hypothesis about continental drift. They use a physical model of moving continents. They reexamine evidence from across the unit and write a final explanation about the *Mesosaurus* fossils.

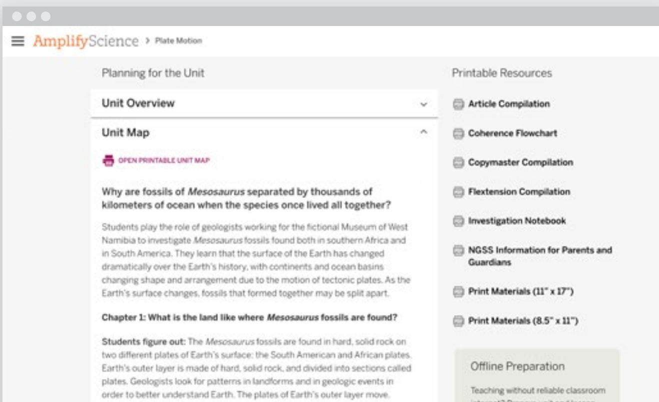


Find the Unit Map in the exemplar Teacher's Guide included in your sample.

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.

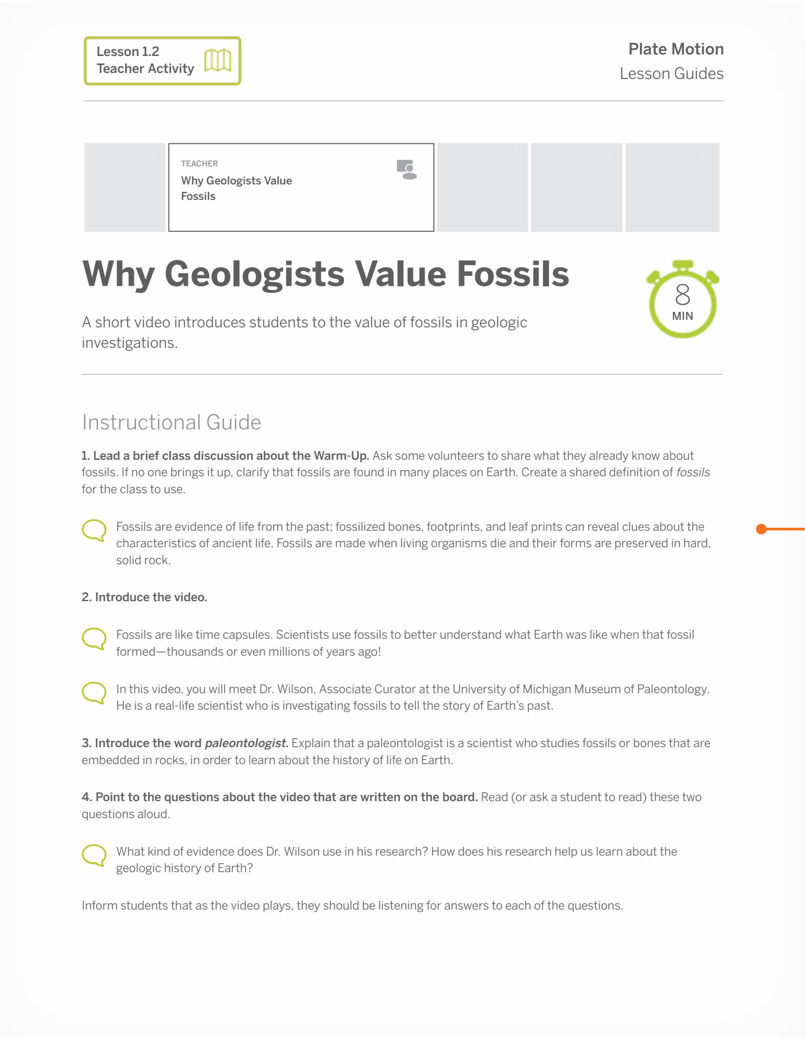
GO ONLINE

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 1.2
Teacher Activity

Plate Motion
Lesson Guides

TEACHER
Why Geologists Value Fossils

Why Geologists Value Fossils

8 MIN

A short video introduces students to the value of fossils in geologic investigations.

Instructional Guide

1. Lead a brief class discussion about the Warm-Up. Ask some volunteers to share what they already know about fossils. If no one brings it up, clarify that fossils are found in many places on Earth. Create a shared definition of *fossils* for the class to use.

Fossils are evidence of life from the past; fossilized bones, footprints, and leaf prints can reveal clues about the characteristics of ancient life. Fossils are made when living organisms die and their forms are preserved in hard, solid rock.

2. Introduce the video.

Fossils are like time capsules. Scientists use fossils to better understand what Earth was like when that fossil formed—thousands or even millions of years ago!

In this video, you will meet Dr. Wilson, Associate Curator at the University of Michigan Museum of Paleontology. He is a real-life scientist who is investigating fossils to tell the story of Earth's past.

3. Introduce the word *paleontologist*. Explain that a paleontologist is a scientist who studies fossils or bones that are embedded in rocks, in order to learn about the history of life on Earth.

4. Point to the questions about the video that are written on the board. Read (or ask a student to read) these two questions aloud.

What kind of evidence does Dr. Wilson use in his research? How does his research help us learn about the geologic history of Earth?

Inform students that as the video plays, they should be listening for answers to each of the questions.

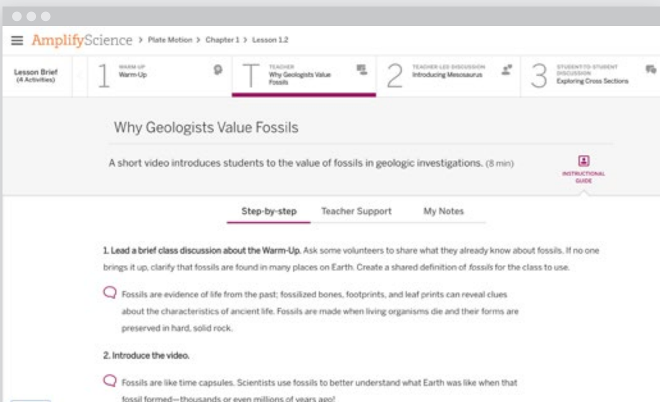
Find the Instructional Guide for Lesson 1.2 in the exemplar Teacher's Guide included in your sample.

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

In Lesson 1.2 of *Plate Motion*, students are introduced to their role of student geologists working for the fictional Museum of West Namibia. They are enlisted to solve the mystery of how the fossils of *Mesosaurus*, which originally lived in the same time and place could be embedded in two rock formations now found 4,000 kilometers and an ocean apart.

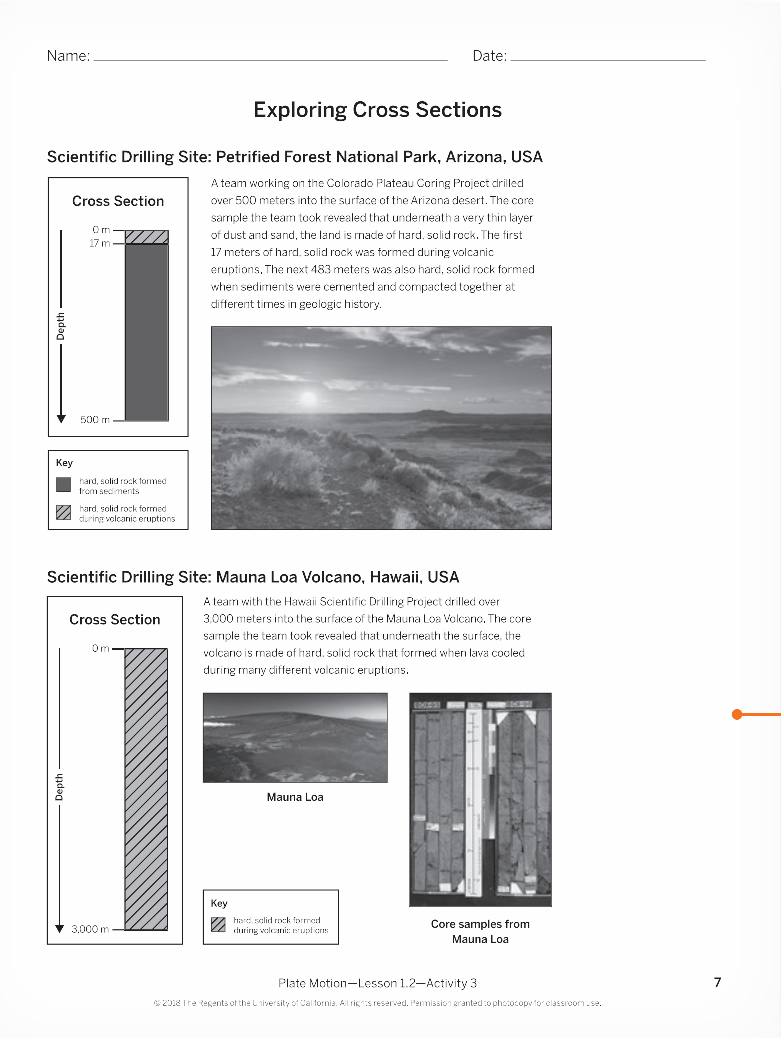
GO ONLINE

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



Walkthrough progress PLAN TEACH ASSESS

Student sample page: Student Investigation Notebook


Name: ______________________ Date: ______________

Exploring Cross Sections

Scientific Drilling Site: Petrified Forest National Park, Arizona, USA

Cross Section

0 m
17 m
Depth
500 m

Key
hard, solid rock formed from sediments
hard, solid rock formed during volcanic eruptions

A team working on the Colorado Plateau Coring Project drilled over 500 meters into the surface of the Arizona desert. The core sample the team took revealed that underneath a very thin layer of dust and sand, the land is made of hard, solid rock. The first 17 meters of hard, solid rock was formed during volcanic eruptions. The next 483 meters was also hard, solid rock formed when sediments were cemented and compacted together at different times in geologic history.

Scientific Drilling Site: Mauna Loa Volcano, Hawaii, USA

Cross Section

0 m
Depth
3,000 m

A team with the Hawaii Scientific Drilling Project drilled over 3,000 meters into the surface of the Mauna Loa Volcano. The core sample the team took revealed that underneath the surface, the volcano is made of hard, solid rock that formed when lava cooled during many different volcanic eruptions.

Mauna Loa

Key
hard, solid rock formed during volcanic eruptions

Core samples from Mauna Loa

Plate Motion—Lesson 1.2—Activity 3 7

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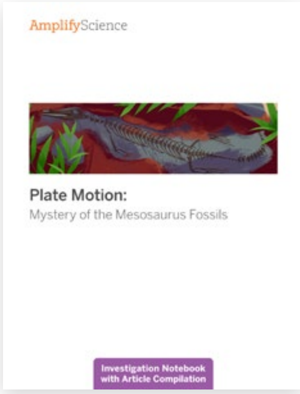
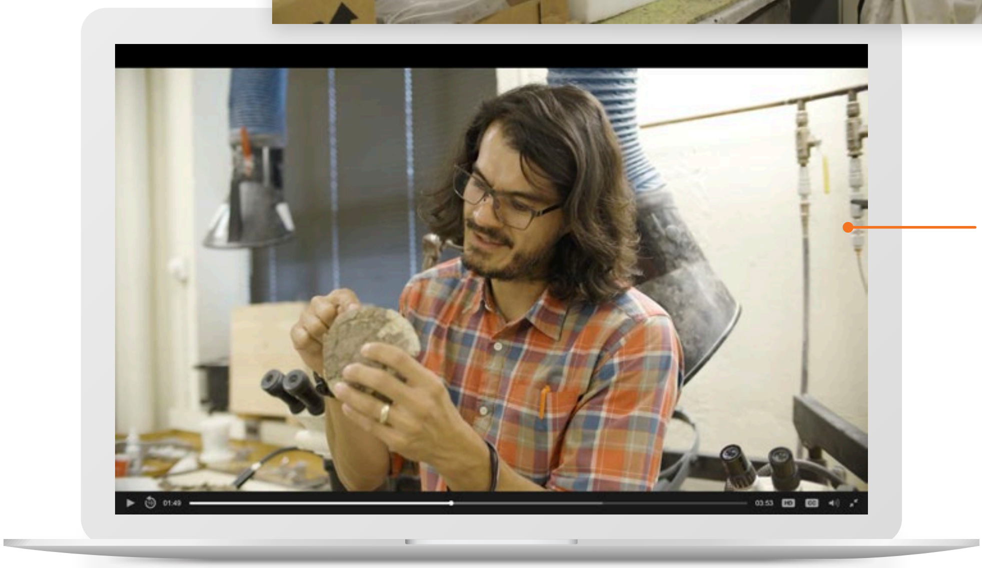


Turn to page 7 in the *Plate Motion* Student Investigation Notebook included in your sample.

As an introduction to plates, students consider and discuss core samples drilled from four very different places on Earth's surface, and together discover that the entire outer layer of Earth is made of hard, solid rock.

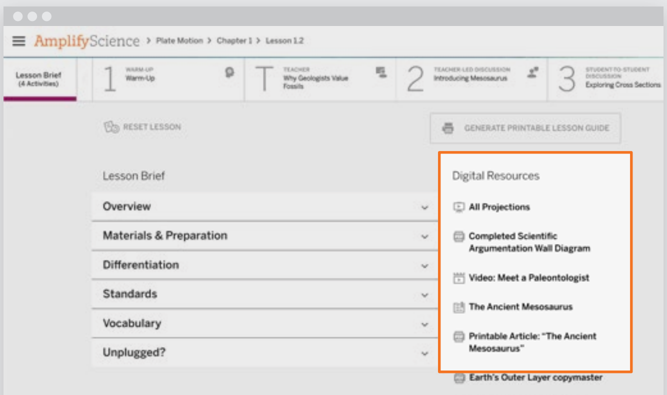
GO ONLINE

Videos can be launched at point-of-use in the digital Teacher's Guide. They can also be downloaded before class from the Digital Resources section of the Lesson Brief.



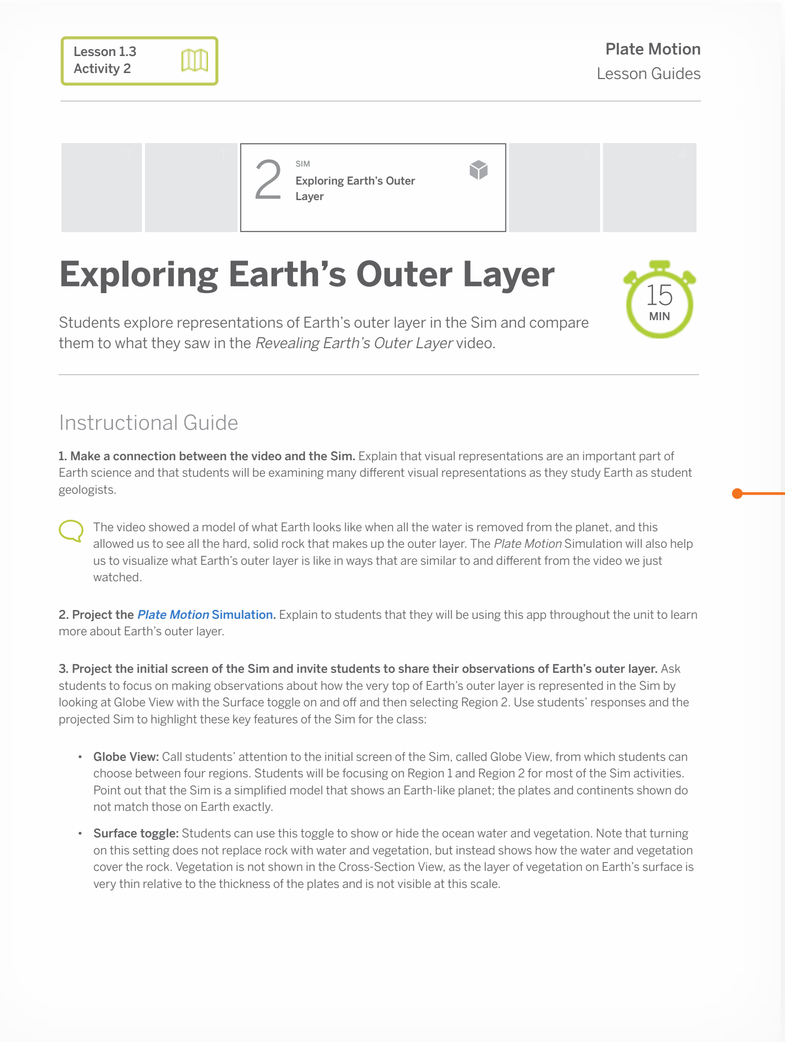
Before watching a brief video, students are invited to write down what they already know about fossils. The video then introduces students to a real-life paleontologist, Dr. Jeff Wilson, from the University of Michigan.

The documentary activates students' background knowledge about fossils, providing a foundation for the unit's mystery and students' role in solving it.



Walkthrough progress PLAN TEACH ASSESS

Teacher and student sample page: Simulation



Lesson 1.3
Activity 2

Plate Motion
Lesson Guides

2 SIM Exploring Earth's Outer Layer

Exploring Earth's Outer Layer

15 MIN

Students explore representations of Earth's outer layer in the Sim and compare them to what they saw in the *Revealing Earth's Outer Layer* video.

Instructional Guide

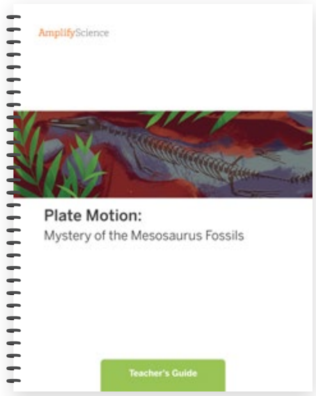
1. **Make a connection between the video and the Sim.** Explain that visual representations are an important part of Earth science and that students will be examining many different visual representations as they study Earth as student geologists.

The video showed a model of what Earth looks like when all the water is removed from the planet, and this allowed us to see all the hard, solid rock that makes up the outer layer. The *Plate Motion* Simulation will also help us to visualize what Earth's outer layer is like in ways that are similar to and different from the video we just watched.

2. **Project the *Plate Motion* Simulation.** Explain to students that they will be using this app throughout the unit to learn more about Earth's outer layer.

3. **Project the initial screen of the Sim and invite students to share their observations of Earth's outer layer.** Ask students to focus on making observations about how the very top of Earth's outer layer is represented in the Sim by looking at Globe View with the Surface toggle on and off and then selecting Region 2. Use students' responses and the projected Sim to highlight these key features of the Sim for the class:

- **Globe View:** Call students' attention to the initial screen of the Sim, called Globe View, from which students can choose between four regions. Students will be focusing on Region 1 and Region 2 for most of the Sim activities. Point out that the Sim is a simplified model that shows an Earth-like planet; the plates and continents shown do not match those on Earth exactly.
- **Surface toggle:** Students can use this toggle to show or hide the ocean water and vegetation. Note that turning on this setting does not replace rock with water and vegetation, but instead shows how the water and vegetation cover the rock. Vegetation is not shown in the Cross-Section View, as the layer of vegetation on Earth's surface is very thin relative to the thickness of the plates and is not visible at this scale.



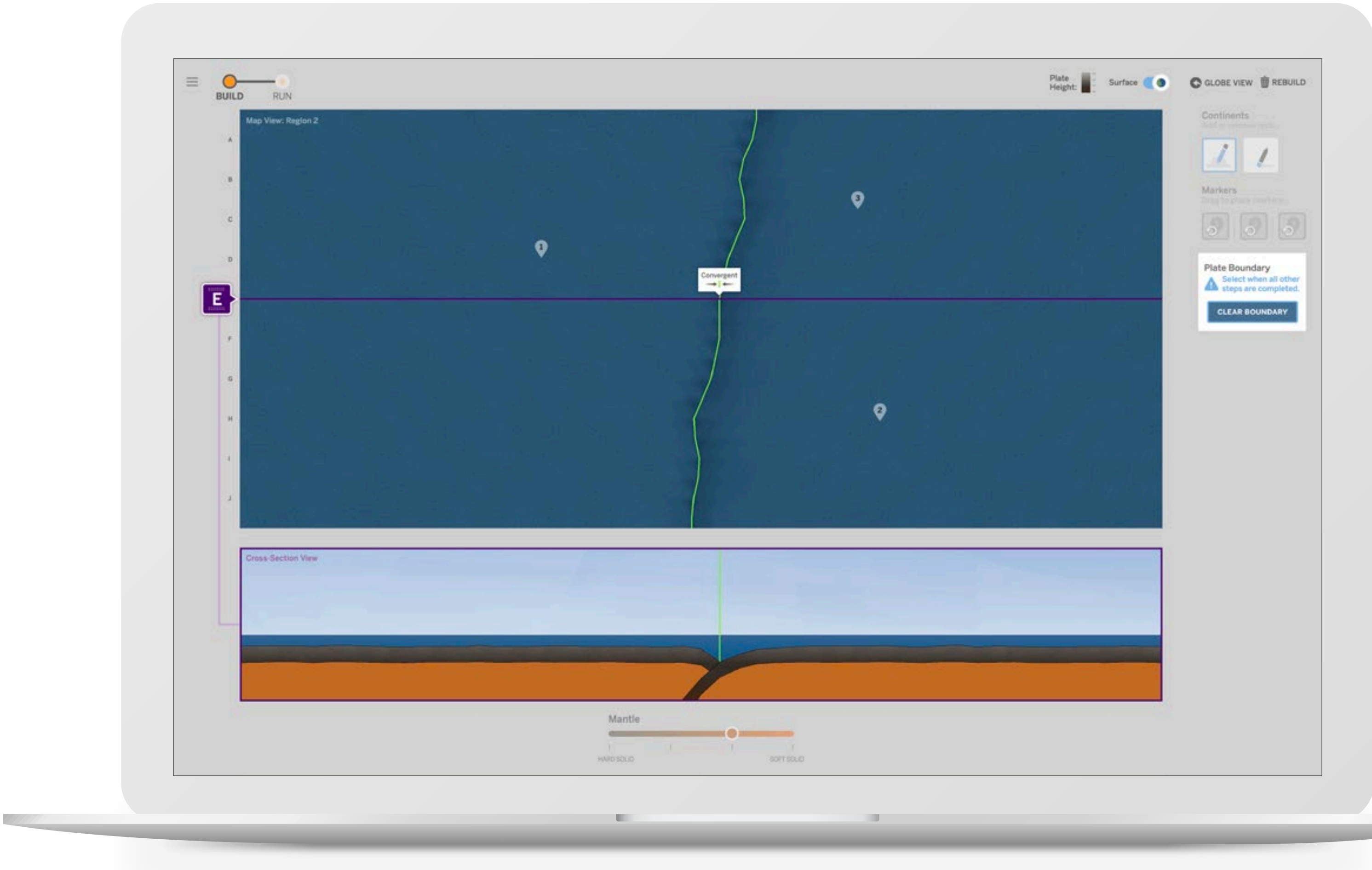
Turn to the Instructional Guide for Lesson 1.3 in the exemplar Teacher's Guide included in your sample.

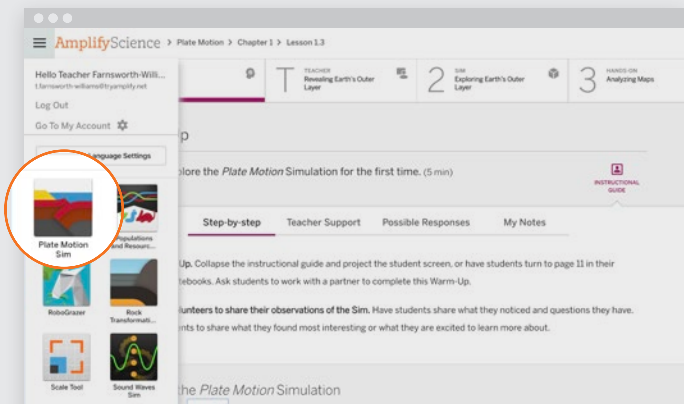
In Lesson 1.3, a guided exploration of the *Plate Motion* Simulation (Sim) provides students the opportunity to understand the Sim's features and to make careful observations about how Earth's outer layer is represented.

After exploring the Sim, students overlay data from a map of Earth's plate boundaries onto a map of earthquakes to identify locations where earthquakes occur. Students thus discover that earthquakes happen in patterns along plate boundaries.

GO ONLINE

You can access the Sim at point-of-use in the Instructional Guide or via the Global Navigation Menu on the left side of the screen.


BUILD
RUN
Plate Height:
Surface
GLOBE VIEW
REBUILD
Map View: Region 2
Continents
Markers
E
Convergent
Plate Boundary
Select when all other steps are completed.
CLEAR BOUNDARY
Cross-Section View
Mantle
HARD SOLID
SOFT SOLID


AmplifyScience
Plate Motion
Chapter 1
Lesson 1.3
Log Out
Go To My Account
Language Settings
Plate Motion Sim
RoboGrazer
Scale Tool
Sound Waves Sim
Revealing Earth's Outer Layer
Exploring Earth's Outer Layer
Analyzing Maps
Step-by-step
Teacher Support
Possible Responses
My Notes

Walkthrough progress PLAN **TEACH** ASSESS

Student sample page: Science article

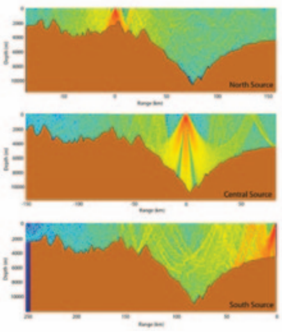
Listening to Earth

Bob Dziak (zee-AK) studies plate boundaries in a surprising way: he listens to them. Dziak is a scientist who works for the National Oceanic and Atmospheric Administration (NOAA), a government department that studies the ocean and the atmosphere. Dziak and his team wanted to know more about what happens on the ocean floor, especially at plate boundaries. Sending people to the bottom of the ocean is difficult, so Dziak and his team used hydrophones—powerful microphones that are built to travel deep under water. The team sent hydrophones 10.99 kilometers (6.83 miles) down into the deepest place in the ocean, an area known as Challenger Deep. Challenger Deep is an underwater canyon,

Bob Dziak is a scientist who studies sound in the ocean.

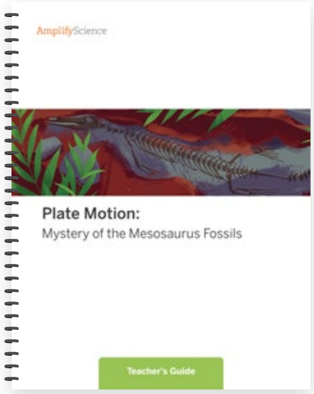
part of a larger landform called the Mariana Trench. Dziak and his team didn't expect to hear very much noise so deep below the ocean's surface. What they actually found surprised them—their hydrophones picked up sounds from many different sources!

One type of sound collected by Dziak and his team was the sound of plate motion in the form of earthquakes. Earthquakes happen at plate boundaries all over the world—they are caused by the motion of plates. Dziak travels all over the world studying plate boundaries under the ocean and using hydrophones to collect data about the earthquakes that happen there. By recording earthquakes at different plate boundaries, Dziak and his team are using sound to study the ways that plates move on Earth.



This diagram shows how sound travels around deep trenches like the Mariana Trench. Here, sound is represented by red and yellow lines. If the source of a sound is directly over the trench, like it is in the middle panel, sound will easily travel into the deepest parts of the trench. However, if the source of the trench, most of the sound is not directly over the trench, most of the sound does not make it to the bottom of the trench.

Listening to Earth B1



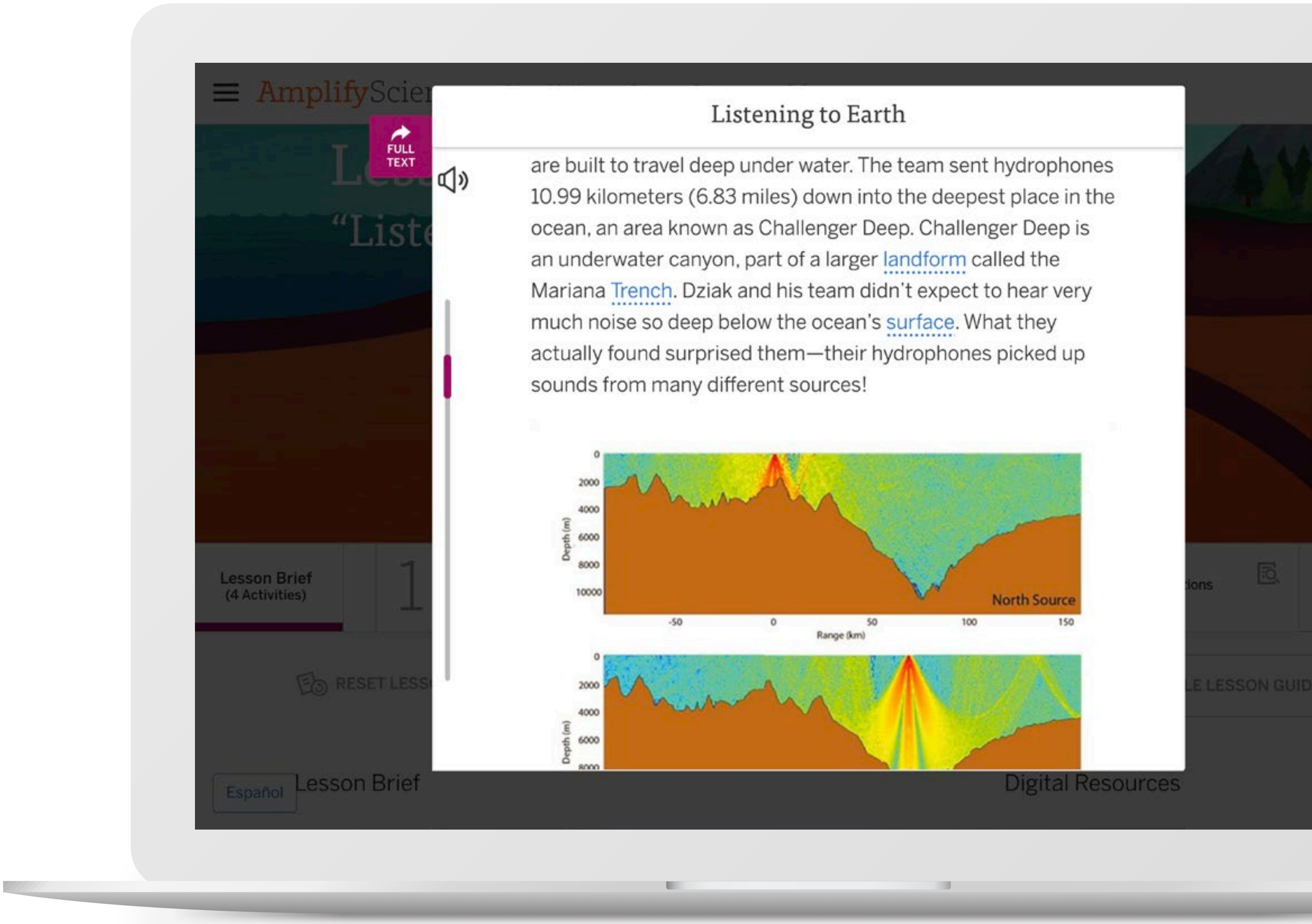
Turn to page B1 in the *Plate Motion* Student Investigation Notebook included in your sample.

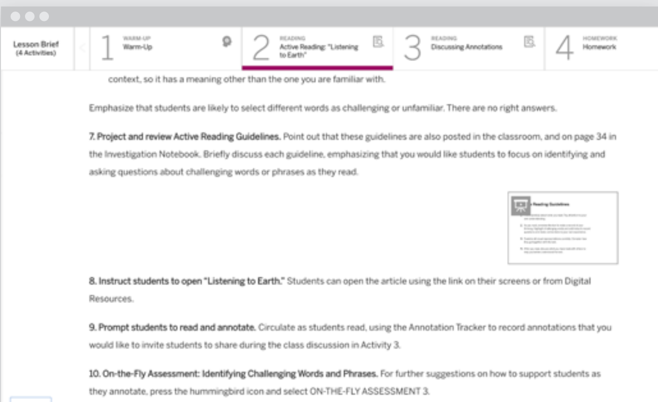
In Lesson 2.2, students practice the Active Reading approach with "Listening to Earth," a science article that helps them learn about how plates move toward and away from each other at plate boundaries. This activity provides an opportunity for an On-the-Fly Assessment of students' ability to engage with scientific texts and identify challenging words.

After reading, students discuss their thinking about the article in order to share important insights and surface alternate conceptions.

GO ONLINE

Teachers and students can access articles at point-of-use in the Lesson. You can also download a PDF file of all articles in the unit from the Printable Resources section of the Unit Guide.


AmplifyScien
FULL TEXT
Listening to Earth
are built to travel deep under water. The team sent hydrophones 10.99 kilometers (6.83 miles) down into the deepest place in the ocean, an area known as Challenger Deep. Challenger Deep is an underwater canyon, part of a larger landform called the Mariana Trench. Dziak and his team didn't expect to hear very much noise so deep below the ocean's surface. What they actually found surprised them—their hydrophones picked up sounds from many different sources!
Depth (m)
North Source
Range (km)
Lesson Brief
(4 Activities)
RESET LESS
Español
Lesson Brief
Digital Resources


Lesson Brief
(4 Activities)
1 WARM-UP Warm-Up
2 READING Active Reading: "Listening to Earth"
3 READING Discussing Annotations
4 HOMEWORK Homework
context, so it has a meaning other than the one you are familiar with.
Emphasize that students are likely to select different words as challenging or unfamiliar. There are no right answers.
7. Project and review Active Reading Guidelines. Point out that these guidelines are also posted in the classroom, and on page 34 in the Investigation Notebook. Briefly discuss each guideline, emphasizing that you would like students to focus on identifying and asking questions about challenging words or phrases as they read.
8. Instruct students to open "Listening to Earth." Students can open the article using the link on their screens or from Digital Resources.
9. Prompt students to read and annotate. Circulate as students read, using the Annotation Tracker to record annotations that you would like to invite students to share during the class discussion in Activity 3.
10. On-the-Fly Assessment: Identifying Challenging Words and Phrases. For further suggestions on how to support students as they annotate, press the hummingbird icon and select ON-THE-FLY ASSESSMENT 3.

Walkthrough progress PLAN TEACH ASSESS

Teacher sample page: Hands-on activity

Lesson 2.3
Activity 3

Plate Motion
Lesson Guides

3 HANDS-ON
Creating Physical Models of Plate Motion

Creating Physical Models of Plate Motion

20 MIN

Students work collaboratively to create physical models of moving plates at convergent and divergent plate boundaries.

Instructional Guide

1. Set context for using physical models to understand plate motion and plate-mantle interactions at plate boundaries. Refer to the *Plate Motion* Model Reference in Digital Resources for photos of the models students will create in this activity. Hold your hands flat in front of you (with palms facing down) and place them side by side so your index fingers are touching.

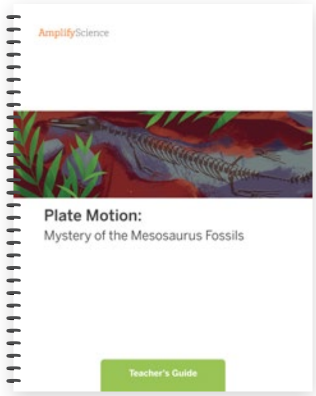
I will now use my hands to model plate motion. Imagine each of my hands is a plate. Now I will move them apart—the way plates move apart at a divergent plate boundary. Can you describe what happens in the space between them?

Move your hands apart to demonstrate this. Have students demonstrate with their hands, as well. Prompt students to point out that there is a large, growing gap between your hands, which would be filled with material that comes up from the mantle as the plates move away from each other at this boundary. Recognize this as one shortcoming of this model; the model does not show what happens with the plates and mantle at this boundary very accurately.

Models are most useful when they accurately represent the natural world. We are going to use towels to create more accurate models of what happens at plate boundaries on Earth, based on what we learned about plate boundaries from the article.

2. Introduce the hands-on activity. Explain that students will work together in groups of four to create two physical models: one of a convergent plate boundary and another of a divergent plate boundary.

You will use the information in your Plate Boundary Comparison Chart to make a model that shows what happens at each boundary as best you can, though you might not be able to model everything that happens at each type of plate boundary with the materials provided to you.



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

In Lesson 2.3, students revisit part of the "Listening to Earth" article to focus on and apply the terms convergent and divergent plate boundaries.

After rereading the article excerpt, students participate in a hands-on investigation of plate motion.

Using notes they took after they read as a guide, students work in groups to create physical models that represent plate motion and plate-mantle interactions at both divergent and convergent plate boundaries.

Lesson 2.4 includes an optional hands-on Flextension for students to further explore and test physical models of plate boundaries, this time using sand, to discover how certain landforms can be created at certain types of boundaries.

Walkthrough progress PLAN TEACH ASSESS

Teacher and student sample page: Introducing a new problem

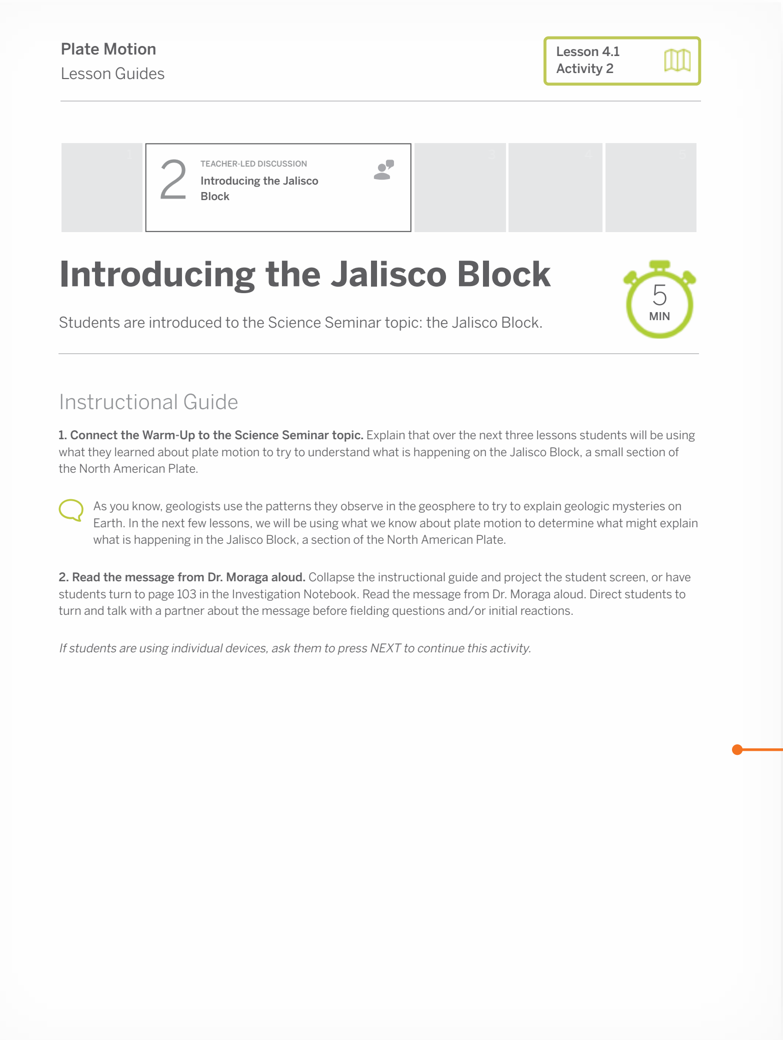


Plate Motion
Lesson Guides

Lesson 4.1
Activity 2

2 TEACHER-LED DISCUSSION Introducing the Jalisco Block

Introducing the Jalisco Block

5 MIN

Students are introduced to the Science Seminar topic: the Jalisco Block.

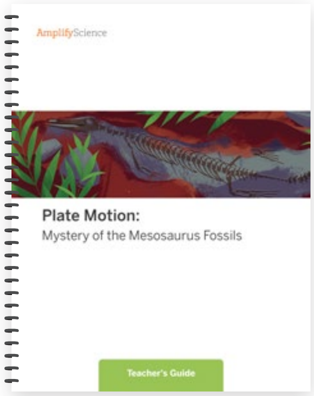
Instructional Guide

1. **Connect the Warm-Up to the Science Seminar topic.** Explain that over the next three lessons students will be using what they learned about plate motion to try to understand what is happening on the Jalisco Block, a small section of the North American Plate.

As you know, geologists use the patterns they observe in the geosphere to try to explain geologic mysteries on Earth. In the next few lessons, we will be using what we know about plate motion to determine what might explain what is happening in the Jalisco Block, a section of the North American Plate.

2. **Read the message from Dr. Moraga aloud.** Collapse the instructional guide and project the student screen, or have students turn to page 103 in the Investigation Notebook. Read the message from Dr. Moraga aloud. Direct students to turn and talk with a partner about the message before fielding questions and/or initial reactions.

If students are using individual devices, ask them to press NEXT to continue this activity.



Turn to the Instructional Guide for Lesson 4.1 in the exemplar Teacher's Guide included in your sample.

In Chapter 4 of *Plate Motion*, students apply their learning to a new problem: how to explain the pattern of volcanic activity and earthquakes on the Jalisco Block in Mexico.

GO ONLINE

Print materials including the Evidence Cards used in Lesson 4.1 are included in the unit's hands-on materials kit. They can also be downloaded from the Unit Guide in the Printable Resources section.

Name: ______________________ Date: ______________

Introducing the Jalisco Block

To: Student Geologists
From: Dr. Bayard Moraga, Lead Curator, Museum of West Namibia
Subject: Jalisco Block

MUSEUM OF WEST NAMIBIA

Thank you so much for all your help with our *Mesosaurus* exhibit. I've submitted your work to our museum's exhibit builders, and they are getting started building and painting a display that tells the *Mesosaurus* story. You've done a great job helping us communicate how the *Mesosaurus* fossils got so far apart!

I just got an email from a colleague who lives in Guadalajara, a city in Jalisco, Mexico. Jalisco is a state located on the North American Plate. This is an interesting area to geologists because it's near many plate boundaries. Many people live in this area of Mexico. I told my colleague about your great work for us here at the Museum of West Namibia, and she wants your help to explain the geologic activity in the area to local residents.

Geologists can't agree on how plates are moving in this area. The data they've collected doesn't point to one clear explanation. We need your help considering the evidence about plate motion in the area.

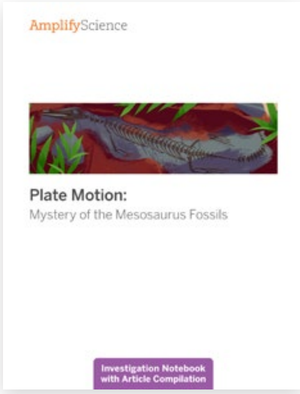
I'm forwarding you the data the geologists sent over that might be useful. Please contact us as soon as you have analyzed the data.

Science Seminar Question: *What best explains the pattern of volcanic activity and earthquakes on the Jalisco Block?*

Claim 1: Convergent movement between the Jalisco Block and the Rivera Plate best explains the pattern of volcanic activity and earthquakes on the Jalisco Block.

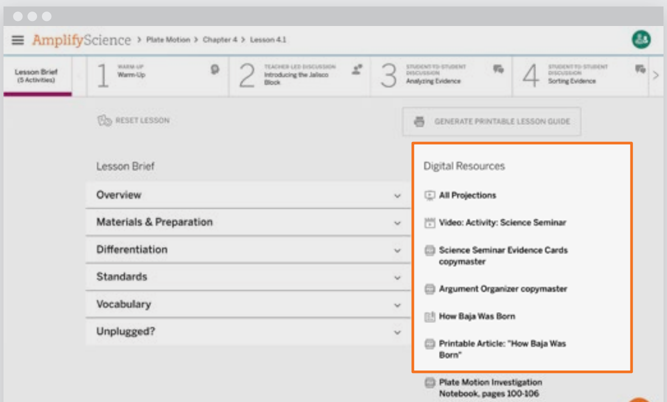
Claim 2: Divergent movement of the Jalisco Block away from the North American Plate best explains the pattern of volcanic activity and earthquakes on the Jalisco Block.

Plate Motion—Lesson 4.1—Activity 2 103



Students read a new message from the Museum of West Namibia to explain the problem before they examine and annotate evidence about the movement of the Jalisco Block in preparation for sorting each piece of evidence based on the claim it supports.

Students then work in pairs to discuss and sort the evidence based on which claim they think it supports. This collaborative activity serves to help students organize their thinking in advance of the Science Seminar discussion that will occur in the next lesson.



Walkthrough progress PLAN TEACH **ASSESS**

Teacher and student sample page: End-of-Unit Assessment

Plate Motion
Lesson Guides

Lesson 4.4
Activity 1

1 CLASS
Multiple-Choice Questions

Multiple-Choice Questions

25 MIN

Students complete 16 multiple-choice questions to show their current understanding of the content after completing this unit.

Instructional Guide

1. **Students complete multiple-choice questions.** Circulate and assist students with clarifying instructions as needed.

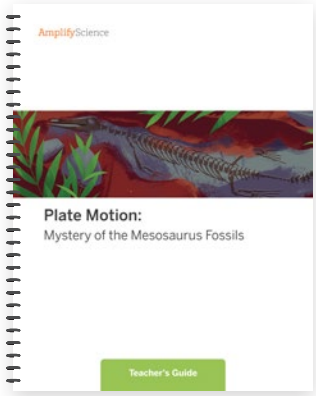
Possible Responses

1. Which statement best describes what Earth's outer layer is like underneath the surface in the image?
b: Underneath both the soil and the ocean, Earth's outer layer is made of hard, solid rock.

2. Dr. Raisa and her team of geologists have been studying GPS data that shows that two plates moved apart. Which diagram shows what happened between the two plates as they moved away from each other?
d: Diagram D: Soft, solid rock from underneath the plates rose and hardened, adding solid rock to the edges of both plates.

3. Fossil remains of *Lystrosaurus* (an extinct four-legged animal) have been discovered in India and South Africa. When they were living, all the *Lystrosaurus* lived together on land, and they could not swim. However, now there is an ocean between the *Lystrosaurus* fossils. What could explain how these fossils got so far apart?
a: India and South Africa are parts of different plates. The plates slowly moved far apart as soft, solid rock from underneath got added to the edges of the plates over millions of years.

4. Scientists often study cross sections to better understand what the inside of something looks like. If we took a cross section of a potted plant by cutting it vertically, what would the cross section look like?
d: Diagram D



Turn to the Instructional Guide for Lesson 4.4 in the exemplar Teacher's Guide and page 117 in the *Plate Motion* Student Investigation Notebook included in your sample.

Students conclude the Science Seminar sequence, and the unit, by writing a scientific argument about which type of plate motion best explains the geologic activity on the Jalisco Block. Students first consider what makes an argument convincing. Then, they use the Reasoning Tool to help them articulate how evidence supports the claim that they have chosen to support. Once students have organized their thinking, they write a scientific argument.

GO ONLINE

Teachers can access an Assessment Guide for students' final written explanations in the Lesson Brief for Lesson 4.4. Three rubrics are provided for assessing students' writing along several dimensions. These dimensions include attention to students' knowledge of core science concepts, their understanding of patterns as applied to a specific phenomenon, and their developing facility with scientific argumentation.

Name: ______________________________ Date: ____________________

Writing a Scientific Argument

On the next page, write your scientific argument to Dr. Moraga and his colleague. As you write, remember to:

- Review your completed Reasoning Tool. Be sure to include your strongest piece of evidence and make a connection between pieces of evidence that go together.
- Use the Scientific Argument Sentence Starters to help you explain your thinking.

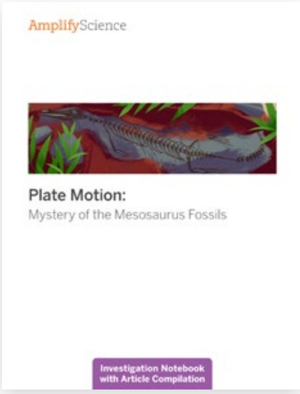
Write a scientific argument that addresses the question *What best explains the pattern of volcanic activity and earthquakes on the Jalisco Block?*

1. First, state your claim.
   - **Claim 1:** Convergent movement between the Jalisco Block and the Rivera Plate best explains the pattern of volcanic activity and earthquakes on the Jalisco Block.
   - **Claim 2:** Divergent movement of the Jalisco Block away from the North American Plate best explains the pattern of volcanic activity and earthquakes on the Jalisco Block.
2. Then, use evidence to support your claim.
3. For each piece of evidence you use, explain how it supports your claim.

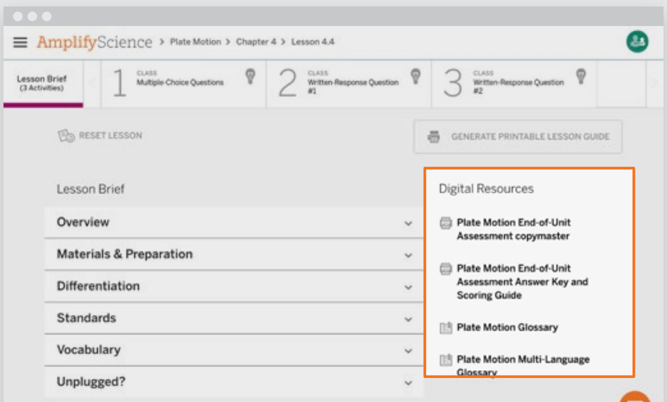
Scientific Argument Sentence Starters

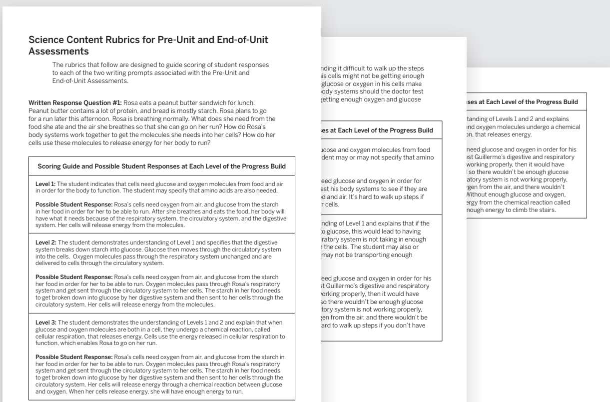
Describing evidence:	**Explaining how the evidence supports the claim:**
The evidence that supports my claim is . . . My first piece of evidence is . . . Another piece of evidence is . . . This evidence shows that . . .	If ___, then . . . This change caused . . . This is important because . . . Since, . . . Based on the evidence, I conclude that . . . This claim is stronger because . . .

Plate Motion—Lesson 4.3—Activity 4 117



Students' final written arguments also serve as three-dimensional performance assessments with rubrics provided to indicate student progress with unit-specific science concepts, crosscutting concepts, and the science practices of Constructing Explanations: Engaging in Argument from Evidence; and Obtaining, Evaluating, and Communicating Information.





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