Amplify Science

Grade 6

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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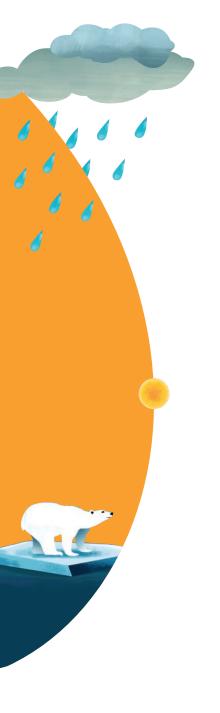
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About Amplify Science

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

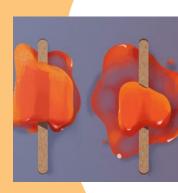
The Next Generation Science Standards have raised the bar in science education. We set out to create a science program that educators can leverage to bring threedimensional learning to life for their students. Educators who adopt Amplify Science have access to a comprehensive curriculum complete with 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





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 researchbased, 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

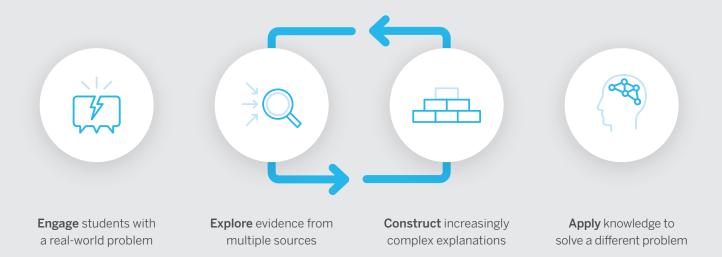
Director, Learning Design Group,

Lawrence Hall of Science

A unique, phenomenabased 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.



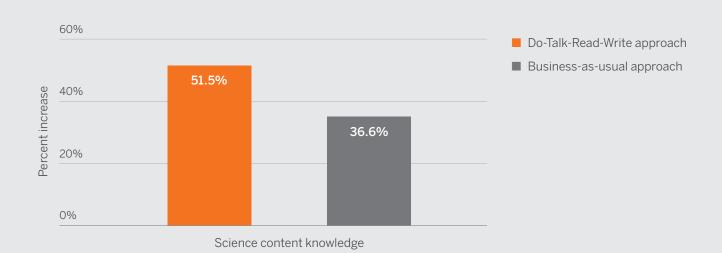
Grounded in research and proven effective

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:



Unit types

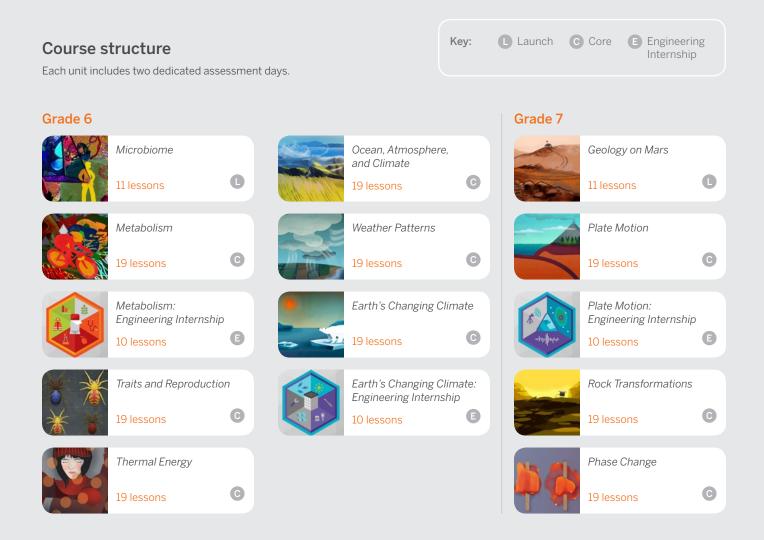
Every Amplify Science unit provides a three-dimensional learning experience. Students will encounter three types of units throughout the course of each year in grades 6-8.

Launch

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

Core

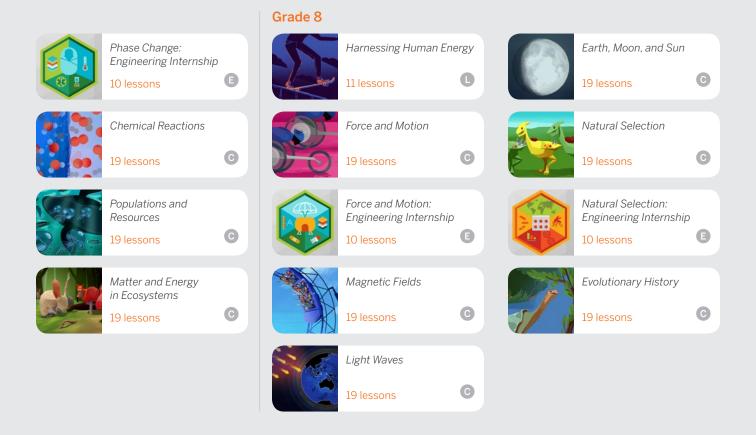
Core units guide students in constructing a deep understanding of science concepts by using key science and engineering practices.



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.



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

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:

Formative

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.



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-ofyear 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





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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.

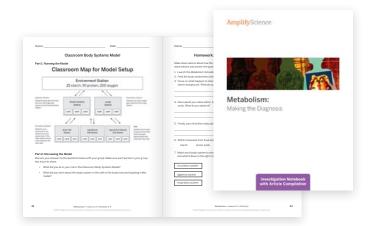


GO ONLINE

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

Student Investigation Notebooks and science articles

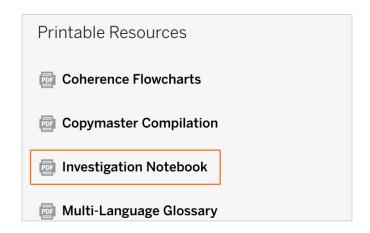
Every unit in Amplify Science has a Student Investigation Notebook, where students record data and observations, make drawings, and complete writing tasks. Scaffolding supports for reading and writing activities are also included in each notebook.



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.

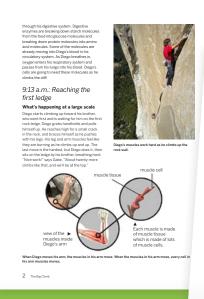
PDF files of individual pages of the Investigation Notebook can be downloaded at point-of-use at the lesson level in the digital Teacher's Guide.



SPANISH LANGUAGE SUPPORT

All Student Investigation Notebooks are also available in Spanish.







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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.





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.

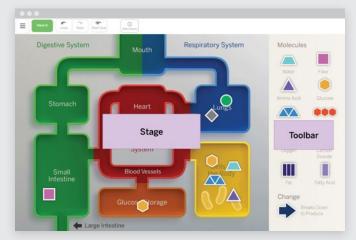
Videos

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.

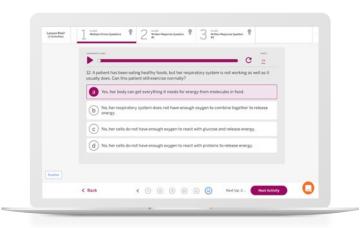


Modeling Tool

Assessments

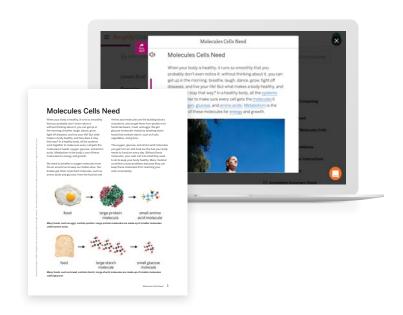
There are a variety of assessments, both formative and summative, embedded in every unit of Amplify Science 6-8. This includes a Pre-Unit, Mid-Unit (or "Critical Juncture"), and End-of-Unit Assessment, each of which consists of a series of 10-20 multiplechoice questions and/or several open-response written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

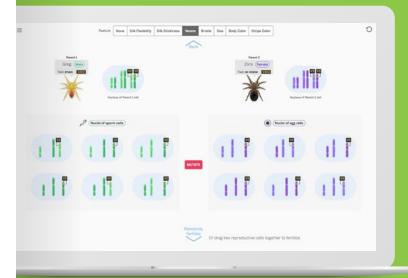
Simulations are just one of several components teachers will use to teach a given scientific concept. The same concepts will be explored through hands-on activities, articles written for the unit, classroom discussions, and more. Each of these tools and techniques gives every student multiple opportunities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

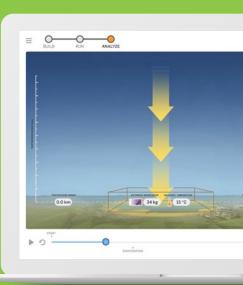












Teacher's Guides

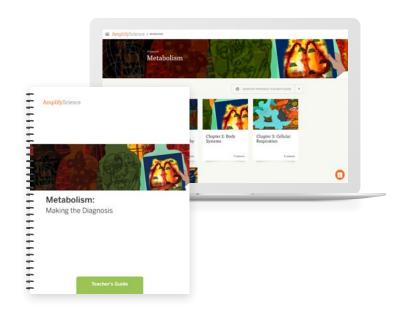
Every unit of Amplify Science includes a comprehensive Teacher's Guide containing lesson plans, differentiation strategies, and other instructional supports and resources at the unit, lesson, and individual activity levels.

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.



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:

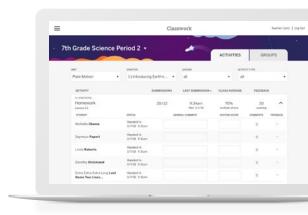
- Color-coded 3-D Statements for every lesson
- Science background information
- Implementation support videos
- · A help desk ready to respond to questions as they arise

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







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Grade 6: Year at a glance

Grade 6 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: Microbiome

19 Lessons

11 45-minute lessons

The *Microbiome* unit provides a compelling on-ramp to learning about the invisible. In it, students learn about the human microbiome and dive into a current topic in science: fecal transplants.

Student role and phenomena

In this unit, students take on the role of student researchers working to figure out the anchor phenomenon for the unit—a fecal transplant cured a patient suffering from a potentially deadly C. difficile infection.

Focal NGSS

Performance Expectations:

MS-LS1-1 • MS-LS1-2 • MS-LS1-3

Focal Disciplinary Core Ideas:

LS1.A LS2.A

Metabolism

19 Lessons

16 45-minute lessons | 3 dedicated assessment days

In the Metabolism: Making the Diagnosis unit, students learn how body systems work together to provide cells in the human body with the molecules they need, how energy is released in the cells through cellular respiration, and how that energy supports movement and cellular growth and repair.

Student role and phenomena

Through inhabiting the role of medical students, students are able to draw the 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 analyze the metabolism of world-class athletes.

Focal NGSS

Performance Expectations:

MS-LS1-1 MS-LS1-2 MS-LS1-3 MS-LS1-7 MS-LS1-8

Focal Disciplinary Core Ideas:

LS1.A LS1.C LS1.D PS3.D

Engineering Internship: Metabolism

10 Lessons

10.45-minute lessons

In the Metabolism Engineering Internship: Health Bars for Disaster Relief unit, Futura Engineering has been hired to design a series of health bars that will feed people in regions affected by natural disasters, with a particular emphasis on two populations who have health needs beyond what can be provided by emergency meals: patients and rescue workers.

Student role and phenomena

Students work as food engineer interns at Futura Engineering and apply their understanding of metabolism to design recipes for bars that balance three criteria: the metabolic needs of a target population, taste, and cost. To do so, interns look at protein, carbohydrates, and the glycemic index of different ingredients.

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

Traits and Reproduction

19 Lessons

16 45-minute lessons | 3 dedicated assessment days

In the Traits and Reproduction: The Genetics of Spider Silk unit, students connect ideas about genes, proteins, traits, and sexual reproduction to form a deep understanding of the causes of variation. They consider intriguing examples of variation drawn from both human contexts (e.g., athletic ability, fraternal and identical twins, and genetic diseases such as hemophilia) and nonhuman contexts, particularly spider silk flexibility.

Student role and phenomena

In this unit, students take on the role of student genetic researchers working with the fictional bioengineering firm Bay Medical Company, which is attempting to breed spiders that produce silk that can be used for medical applications. Students are faced with the challenge of explaining how the silk flexibility traits of closely related spiders can vary.

Focal NGSS

Performance Expectations:

MS-LS1-2 MS-LS1-4 MS-LS1-5 • MS-LS3-1 MS-LS3-2 MS-LS4-5

Focal Disciplinary Core Ideas:

LS1.A LS1.B LS3.A LS3.B LS4.B

Thermal Energy

19 Lessons

16 45-minute lessons | 3 dedicated assessment days

In the Thermal Energy: Using Water to Heat a School unit, students go beyond intuition to discover that observed temperature changes can be explained by the movement of molecules, which facilitates the transfer of kinetic energy from one place to another.

Student role and phenomena

In their role as student thermal scientists, students help the principal of fictional Riverdale School choose a new heater system. The principal is considering two proposed systems, both of which would use water to heat the school. How these two systems work serves as the anchor phenomenon for this unit and the explanations students construct allow them to make a recommendation to the principal.

Focal NGSS

Performance Expectations:

MS-PS3-3 MS-PS3-4 MS-PS3-5

Focal Disciplinary Core Ideas:

PS3.A PS3.B

Ocean, Atmosphere, and Climate

19 Lessons

16 45-minute lessons 3 dedicated assessment days

In the Ocean, Atmosphere, and Climate: Cold Years in New Zealand unit, students investigate how ocean currents behave and what effect they have on the climate of different locations around the world, specifically the air temperature of various locations.

Student role and phenomena

In the role of climatologists, students investigate changes in air temperature in Christchurch, New Zealand, during El Niño years. Students are called upon to help the fictional New Zealand Farm Council explain what causes the change in air temperature.

Focal NGSS

Performance Expectations:

MS-ESS2-6

Focal Disciplinary Core Ideas:

ESS2.D

Weather Patterns

19 Lessons

16 45-minute lessons | 3 dedicated assessment days

In the Weather Patterns: Severe Storms in Galetown unit, students learn about how differences in the amount of water vapor, temperature, and air pressure can affect how much it rains.

Student role and phenomena

In the role of student forensic meteorologists, students investigate why the fictional Galetown is having severe rainstorms—a mystery that is concerning residents. They investigate how water vapor, temperature, energy transfer, and wind influence local weather patterns and how these factors can lead to severe rainstorms.

Focal NGSS

Performance Expectations:

MS-ESS2-4 MS-ESS2-5

Focal Disciplinary Core Ideas:

ESS2.C ESS2.D

Earth's Changing Climate

19 Lessons

16 45-minute lessons | 3 dedicated assessment days

In the Earth's Changing Climate: Vanishing Ice unit, students figure out that whenever more energy enters the atmosphere than exits, the amount of energy absorbed by the surface increases and that increased carbon dioxide or methane in the atmosphere redirects outgoing energy back to Earth's surface.

Student role and phenomena

Students adopt the role of climatologists who help the fictional World Climate Institute research causes of ice loss and climate change with the goal of educating the public about their findings.

Focal NGSS

Performance Expectations:

MS-ESS3-3 MS-ESS3-4 MS-ESS3-5

Focal Disciplinary Core Ideas:

ESS3.C • ESS3.D

Engineering Internship: Earth's Changing Climate 10 Lessons

10 45-minute lessons

In the Earth's Changing Climate Engineering Internship: Rooftops for Sustainable Cities unit, students use engineering practices and their knowledge of climate change to design a solution for making a city more environmentally responsible.

Student role and phenomena

As civil engineering interns at Futura Engineering, students learn about the Design Cycle and apply their understanding of energy and climate science to create roof modification designs for a city in the desert.

Focal NGSS

Performance Expectations:

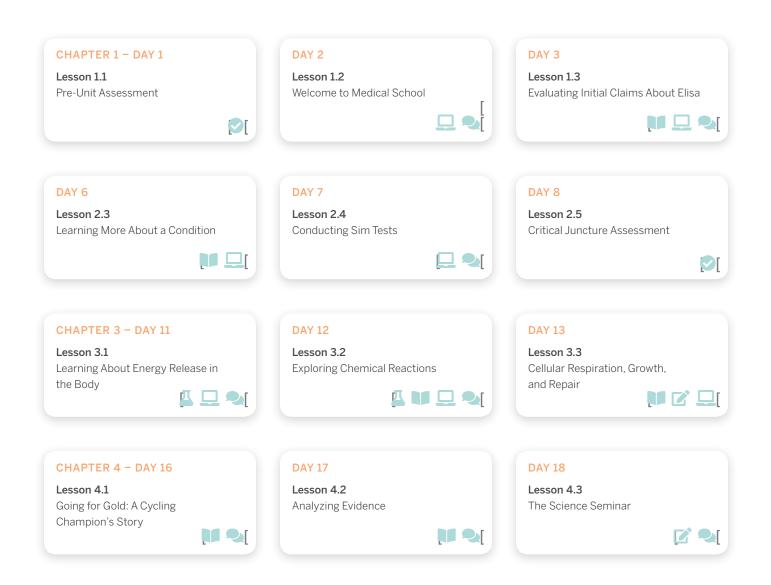
MS-ETS1-1 MS-ETS1-2 MS-ETS1-3 MS-ETS1-4 MS-ESS3-3

Focal Disciplinary Core Ideas:

ETS1.A ETS1.B ETS1.C ESS3.C

Deep dive: Metabolism

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





CHAPTER 2 - DAY 4

Lesson 2.1

Exploring the Classroom Body Systems Model



DAY 5

Lesson 2.2

Patient Stories: Problems with **Body Systems**





DAY 9

Lesson 2.6

Playing Guess My Model

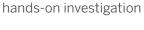


DAY 10

Lesson 2.7

Diagnosing Elisa





DAY 14

Lesson 3.4

"Blood Doping: Messing with Metabolism to Win Races"



DAY 15

Lesson 3.5

Modeling Cellular Respiration in an Athlete's Body







Lesson includes use of digital modeling tools or Simulations

Lesson includes scientific

Lesson includes a reading

Lesson includes a

writing activity

activity with science articles



Lesson 4.4

End-of-Unit Assessment





Dedicated assessment day



Lesson includes a discussion activity

Unit storyline: Metabolism

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



Through inhabiting the roles of medical students, 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 diagnose a patient and analyze the metabolism of world-class athletes.

By investigating the anchor phenomenon—a patient whose body systems are not working properly students learn how body systems work together to provide the trillions of cells in the human body with the molecules they need. By exploring how athletic

training improves the body's functions, students learn how energy is released in the cells through cellular respiration and how that energy supports movement and cellular growth and repair.

In the final chapter of the unit, students consider a new anchor phenomenon to apply what they have learned: determining whether a particular athlete's improved performance from increasing cellular respiration could have been the result of blood doping.

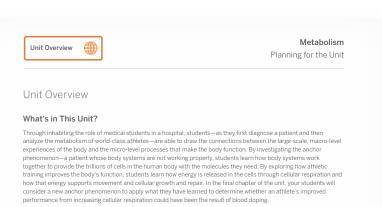
Sample unit walkthrough

Walkthrough progress





Teacher sample page: Unit Overview

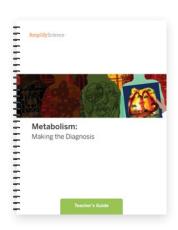


Why?

This unit has been designed to connect ideas about the human body that have often been taught in isolation from one another. In a typical curriculum, students may learn about the parts of the cell in one unit, cellular respiration in another, and body systems many months later. As a result, students are not guided to draw connections between these and body systems many months later. As a result, students are not guided to draw connections between these concepts, or to connect the abstract concepts to their actual experiences with their own bodies. They are also never provided the experience of connecting microscopic processes (how molecules from the environment are broken down and enter the cells to produce energy and to aid in cellular growth and repair) to the macro-level functions of the body systems and our overall health. We chose the medical student role because it provides a compelling and accessible context for connecting ideas about cells, body systems, molecules, and energy with phenomena that students are likely to be familiar with in their own bodies. This unit builds on students' interest in and awareness of problems like asthma and diabetes, as well as an interest in how the bodies of athletes who are competing at their peak of performance can

Chapters 1 and 2 focus on how body systems work together to take molecules from the environment and get them, in Chapters I and 2 tocus on how body systems work together to take molecules from the environment and get them, in usable form, to the cells. Students are presented with the challenge of helping diagnose a teenage patient. Elisa, who feels tired all the time. Through exploring the Metabolism Simulation, reading about different medical conditions, and participating in a classroom-sized model of the body, students learn that in a functioning body the digestive, respiratory, and circulatory systems work together to get glucose, oxygen, and amino acids to the cells. By the end of Chapter 2, students diagnose Elisa with diabetes and are able to explain how this condition affects her body systems and the molecules that get to her cells.

In Chapter 3, students learn more about what the cells do with these molecules. They explore the effects of activity on their own bodies and in the Simulation, and are then introduced to cellular respiration, the chemical reaction that releases energy in the cells. Students learn that the energy released in cellular respiration also supports growth and repair at the cellular level. Students shift their focus to considering cellular respiration in the context of high-performance athletes and read an article about a controversial practice called blood doping, which is used to enhance athletic performance. They apply what they have learned as they prepare to participate in a whole-class discussion and debate routine called a Science Seminar. Then, in Chapter 4, to prepare for the Science Seminar, students analyze evidence to determine if an athlete increased his cellular respiration and improved his athletic performance through



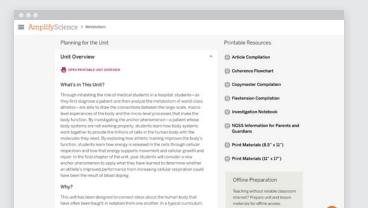


Find the Unit Overview in the exemplar Teacher's Guide included in your sample.

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.

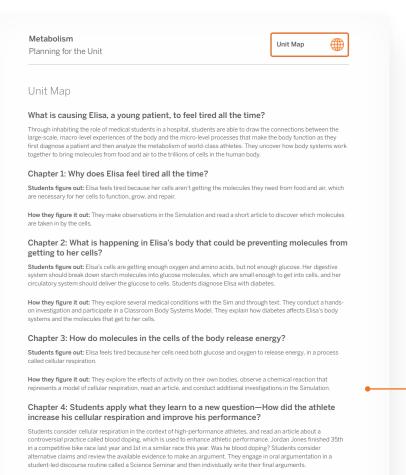


To access the Unit Overview in the digital Teacher's Guide, expand the "Unit Overview" section of the Unit Guide when you first click into a unit. The Unit Overview is also downloadable as a PDF.





Teacher sample page: Unit Map





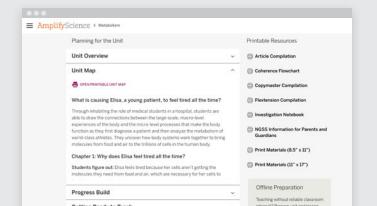


Find the Unit Map in the exemplar Teacher's Guide included in your sample.

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.



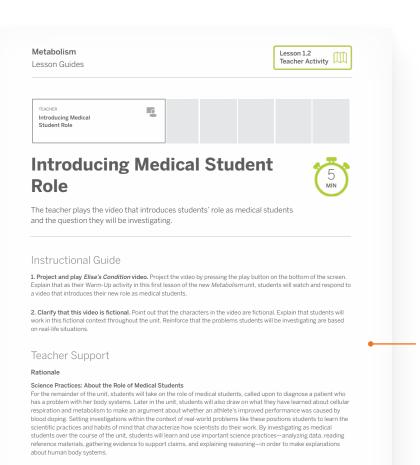
To access the Unit Map in the digital Teacher's Guide, expand the "Unit Map" section of the Unit Guide when you first click into a unit. The Unit Map is also downloadable as a PDF.

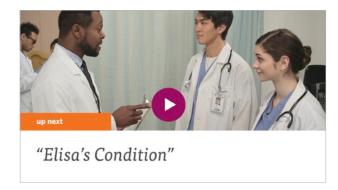






Teacher sample page: Instructional Guide







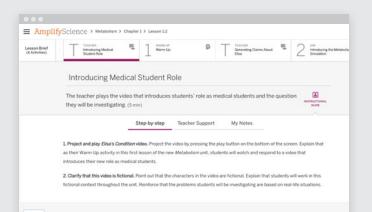
Find the Instructional Guide for Lesson 1.2 in the exemplar Teacher's Guide included in your sample.

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

In Lesson 1.2 of Metabolism, students watch a video that introduces them to their role of medical students who will diagnose Elisa, a young patient who feels tired all the time.



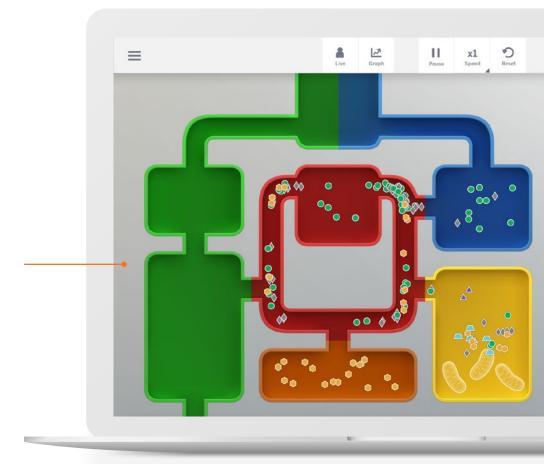
To access the Instructional Guide in the digital Teacher's Guide, click on any activity within a Lesson.







Student sample page: Simulation



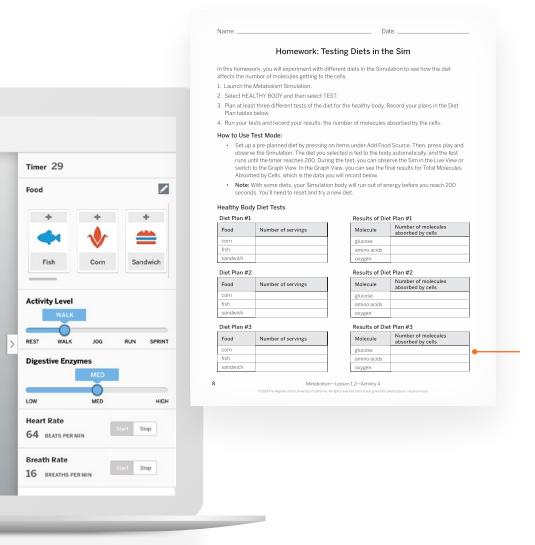
In Lesson 1.2. students are introduced to the Metabolism Sim.

The Metabolism Sim is a powerful tool that allows students to investigate processes within the human body that are either hidden or too small to directly observe. The objective of this initial experience with the Sim is to visualize how a healthy body processes and stores energy



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.





Turn to page 8 of the Metabolism Student Investigation Notebook included in your sample.

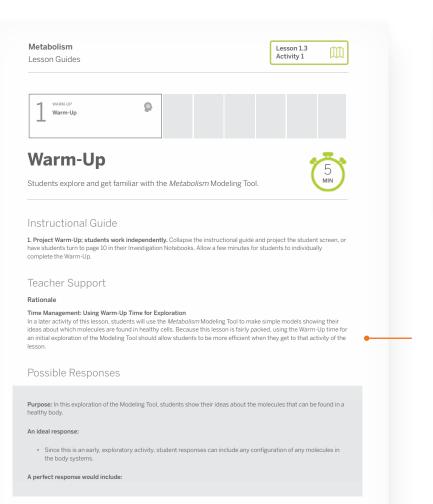
For homework, students continue to explore the Sim, experimenting with different diets to observe the relationship between food intake and molecules getting to the cells.







Teacher and student sample page: Science article







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

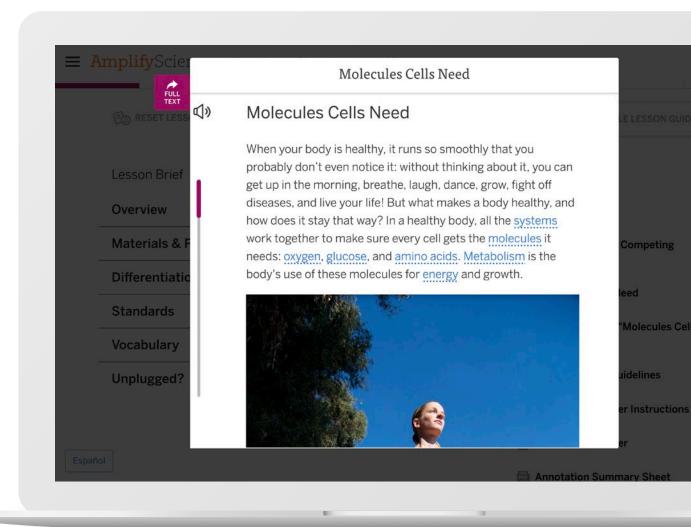
In Lesson 1.3, students engage in active reading with an article called "Molecules Cells Need." They learn that cells need glucose, oxygen, and amino acid molecules to generate energy and grow and repair themselves.

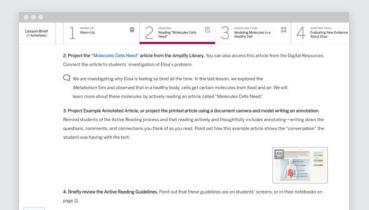
Students can access the article online or in the printed Student Investigation Notebook.



GO ONLINE

Teachers and students can access articles at pointof-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.

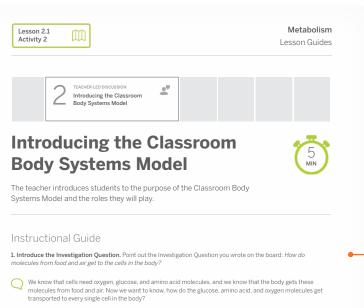








Teacher sample page: Hands-on activity







Turn to the Instructional Guide for Lesson 2.1, Activity 2, in the exemplar print Teacher's Guide included in your sample.

In the first lesson of Chapter 2, students engage in a hands-on activity to model how body systems work together.

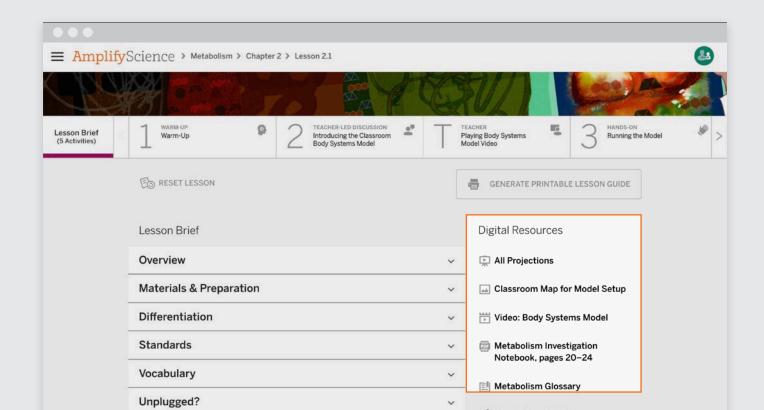
The activity begins with the teacher introducing the purpose of the activity and showing a short video about villi, alveoli, and cell membranes.

Students then work together to create a classroomsized model of the human body in which students play the roles of body systems delivering molecules (represented by pipe cleaners) to cells.



GO ONLINE

In the Digital Resources for this Lesson (located in the Lesson Brief), teachers can access a possible setup guide for the hands-on investigation.







Student sample page: Writing explanations

| Writing About El Elisa's diabetes causes her to have lower than normal nun You already wrote about how this makes her tired. Now, write an explanation that answers the question, How body's ability to grow and repair cells? Use the following sentence to start your explanation, or us | abers of glucose molecules in her cells. |
|---|--|
| You already wrote about how this makes her tired. Now, write an explanation that answers the question, How body's ability to grow and repair cells? | • |
| body's ability to grow and repair cells? | 1150 1 0 1 1 1 1 1 1 1 |
| 3. Use the following sentence to start your explanation, or us | COUID EIISA'S DIADETES AISO ATTECT NET |
| | se a sentence of your own. |
| Diabetes could affect how well Elisa's cells can grow an | nd repair themselves. |
| Vord Bank | |
| glucose | amino acid |
| oxygen | protein |
| cellular respiration | energy |
| | |
| | |
| | |
| Metabolism—Lesson 3.3—Act | ivity 4 |





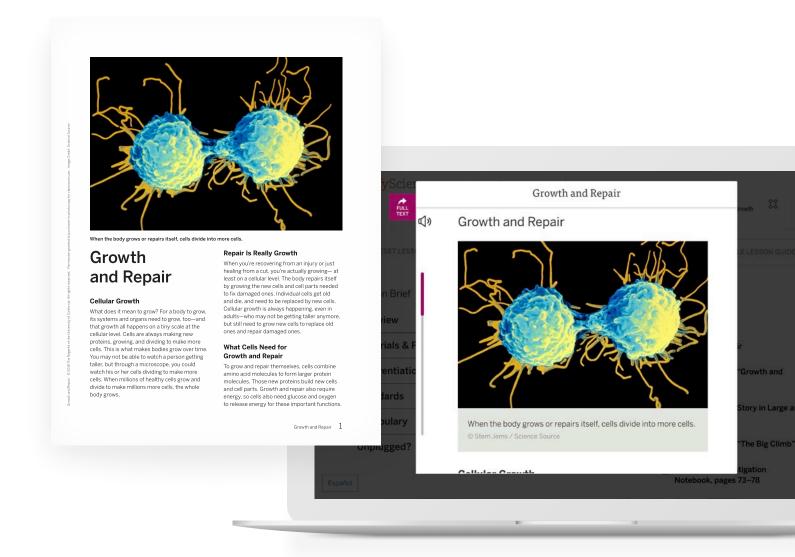
Turn to page 77 in the Metabolism Student Investigation Notebook included in your sample.

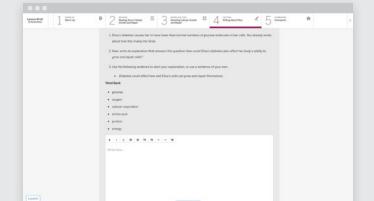
In Lesson 3.3, students read and annotate the article "Growth and Repair" before participating in a class discussion about the body's ability to grow and repair cells.

At the end of Lesson 3.3, students connect the idea of cellular growth to Elisa's condition, which they have diagnosed as diabetes, and engage in a writing activity to explain how the disease could affect how well Elisa's cells can grow and repair themselves.



Students can complete their work in their printed Student Investigation Notebook or compose their answers online and send them directly to the teacher.

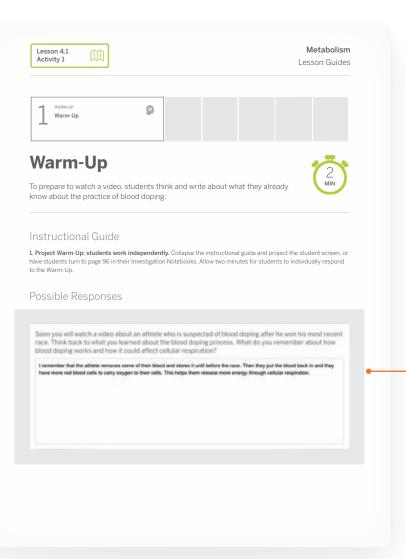








Teacher sample page: Introducing a new problem







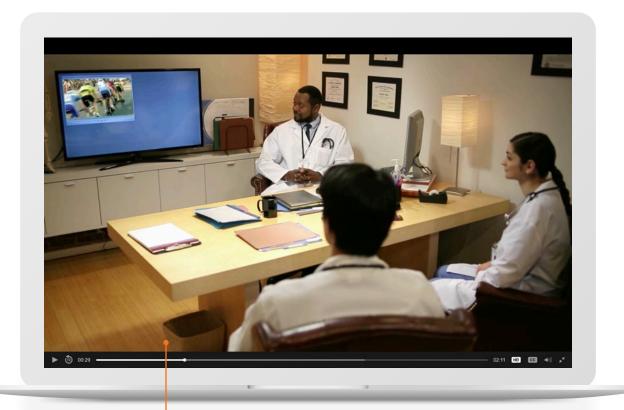
By the beginning of Chapter 4, students are ready to be introduced to the Science Seminar, where they'll use their newly acquired knowledge of body systems to argue for or against claims related to a new problem: whether or not an athlete is blood doping to improve his performance.

Before students are introduced to the athlete in question, they read, annotate, and discuss an article on blood doping.

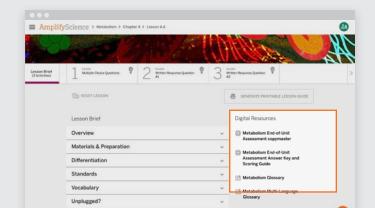


GO ONLINE

Navigate to the Lesson Brief for Lesson 4.4 and download the Assessment Guide from the Digital Resources section on the right side of your screen.



Afterwards, students watch a brief video about Jordan Jones, a fictional cyclist who went from 35th place in a race last year, to winning it this year. Over the next few lessons, students will analyze various pieces of evidence and organize their thoughts on the claims being made about Jones, before finally participating in the full-class, student-led discussion called the Science Seminar.







Teacher and student sample page: Final written argument



Name: Homework: Writing a Final Argument You have considered three claims. blood doping.

Over the last few days, you and your classmates thought about arguments that could be made to

Date:

How did the athlete increase his cellular respiration and improve his performance?

- Claim 1: Jordan Jones increased his cellular respiration and improved his performance by
- · Claim 2: Jordan Jones increased his cellular respiration and improved his performance by changing his pre-race meal.
- Claim 3: Jordan Jones increased his cellular respiration and improved his performance by training at a higher altitude.

Your final written argument about Jordan Jones has three parts:

- · Part 1: Writing an argument to support Claim 1 or Claim 3.
- · Part 2: Explaining why the other claim is not as strong.
- · Part 3: Explaining why Claim 2 is not supported.

Scientific Argument Sentence Starters

Describing evidence: Describing how evidence supports a claim: The evidence that supports my claim is . . . If _____, then . . My first piece of evidence is . . . This is important because . . . This evidence shows . . Based on the evidence, I conclude that . .

Turn to page 110 in the Metabolism Student Investigation Notebook included in your sample.

The Metabolism Science Seminar sequence ends with students crafting a final written argument about Jones' sudden improvement in performance.

Metabolism-Lesson 4.3-Activity 4



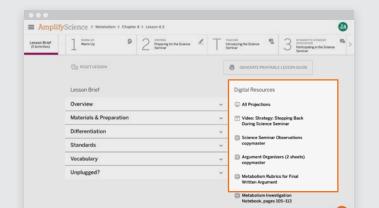
GO ONLINE

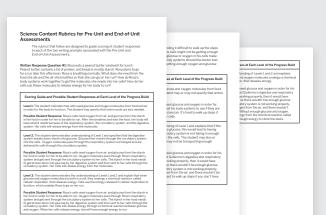
Teachers can access an Assessment Guide for students' final written explanations in the Lesson Brief for Lesson 4.3. Three rubrics are provided for assessing students' writing along several dimensions. These dimensions include attention to students' mastery of core unit concepts, students' understanding of Systems and System Models, and their ability to construct scientific arguments.

| Name: | Date: |
|---|--|
| Homework: Writ | ting a Final Argument (continued) |
| | ice Cards, along with any other evidence from the unit you that you think is strongest based on all the evidence that was |
| Write the claim you chose first, then cor who reads it, your argument should exp | mplete the argument. In order to be convincing to someone plain: |
| what cellular respiration is; | |
| what blood doping or training at | a higher altitude does to increase cellular respiration; and |
| why you think your claim is the b | est explanation for Jordan Jones's improved performance. |
| | |
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| | |
| | |
| | nce Cards to explain why you think the other claim (Claim 1 or |
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| | nce Cards to explain why you think the other claim (Claim 1 or |
| | nce Cards to explain why you think the other claim (Claim 1 or |
| Claim 3) is not as strong. | nce Cards to explain why you think the other claim (Claim 1 or a claim) and the control of the c |



Students' final written arguments also serve as threedimensional performance assessments with rubrics provided to indicate student progress with unitspecific science concepts, crosscutting concepts, and the science practices of constructing explanations: Engaging in Argument from Evidence; and Obtaining, Evaluating, and Communicating Information.





For more information on Amplify Science, visit amplify.com/science68.



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