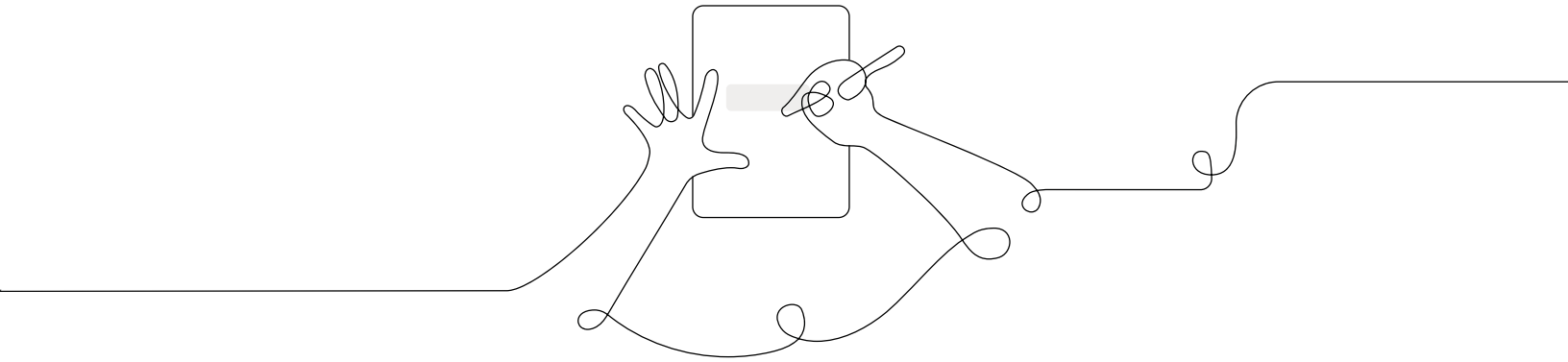
AmplifyScience

Participant Notebook

Grade 3 - Unit 3: Environments and Survival
Internalization / Guided Planning



Reflection

Use the provided spaces as a place for reflection throughout the session.

Session goals and student outcomes

What	Why	How

Year at a glance

Units per year

K–2 **3**

3–5 **4**

Unit types

Although every Amplify Science unit provides a three-dimensional learning experience, each unit emphasizes one of the following specific science and engineering practices.

Investigation

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

Modeling

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

Engineering design

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

Argumentation (grades 3–5)

These Amplify Science units provide extra support to students engaging in the practice of argumentation. As students move up the K–5 grades, they focus on important aspects of argumentation in an intentional sequence.

Course structure

Key

- A Argumentation
- E Engineering design
- I Investigation
- M Modeling

Kindergarten (66 lessons)

Needs of Plants and Animals **22 lessons** I
Pushes and Pulls **22 lessons** E
Sunlight and Weather **22 lessons** M

Grade 1 (66 lessons)

Animal and Plant Defenses **22 lessons** M
Light and Sound **22 lessons** E
Spinning Earth **22 lessons** I

Grade 2 (66 lessons)

Plant and Animal Relationships **22 lessons** I
Properties of Materials **22 lessons** E
Changing Landforms **22 lessons** M

Grade 3 (88 lessons)

Balancing Forces **22 lessons** M
Inheritance and Traits **22 lessons** I
Environments and Survival **22 lessons** E
Weather and Climate **22 lessons** A

Grade 4 (88 lessons)

Energy Conversions **22 lessons** E
Vision and Light **22 lessons** I
Earth's Features **22 lessons** A
Waves, Energy, and Information **22 lessons** M

Grade 5 (92 lessons)

Patterns of Earth and Sky **22 lessons** I
Modeling Matter **22 lessons** M
The Earth System **26 lessons** E
Ecosystem Restoration **22 lessons** A

K-5 Program components

The K-5 program contains both physical and digital instructional materials. The table below describes materials and, when applicable, includes links to find additional information.

Teacher materials

Teacher's Guide	Contains all of the unit's lesson plans, differentiation strategies, and an assortment of instructional supports and resources at the unit, lesson, and individual activity level (also available in print for purchase): bit.ly/amplifyk5navigation
Classroom Slides	Each lesson has a downloadable and editable PowerPoint or Google Slides file to help guide teachers and students through the lesson: bit.ly/amplifyslideshowto
Classroom Wall materials	The printed Classroom Wall materials can be found in the unit kit. PDFs are also provided in the digital Teacher's Guide: bit.ly/amplifyclassroomwall
Embedded assessments	Includes formal and informal opportunities for students to demonstrate understanding and for teachers to gather information: bit.ly/amplifyk5assessment
Program Guide	A resource for finding out more about the program's structure, components, supports, how it meets the standards, and flexibility: bit.ly/amplifyprogramguide
Program Hub	Features remote learning resources, training videos, hands-on investigation videos, and Professional Learning resources: bit.ly/amplifyprogramhub

Student materials

Hands-on materials	The unit kit includes both consumable and non-consumable physical materials used for the hands-on activities that are carried out at strategic points throughout the unit. bit.ly/amplifymaterials
Investigation Notebooks	Contains instructions for student activities and space for students to record data, reflect on ideas from texts and investigations, and construct explanations and arguments: bit.ly/amplifyk5fillable
Student books	Informational texts written by the Lawrence Hall of Science allow students to practice reading within the science content area: bit.ly/amplifystudentbooks
Digital applications	Digital tools and simulations, available across grades 2–5, support and advance learning objectives by giving students opportunities to analyze data, visualize phenomena, and share their thinking: bit.ly/amplifydigitaltools

Curriculum add-ons

Spanish-language licenses	Spanish materials that mirror their English counterparts in both content and quality are also available for purchase: bit.ly/amplifyspanish
Interactive Classroom	A new digital interface for teachers and students designed for classrooms in which every student has a digital device: bit.ly/amplifyinteractiveclassroom

Three dimensional learning reference

3-D learning engages students in using scientific and engineering practices and applying crosscutting concepts as tools to develop understanding of and solve challenging problems related to disciplinary core ideas.

Science and Engineering Practices

1. **Asking Questions and Defining Problems**
2. **Developing and Using Models**
3. **Planning and Carrying Out Investigations**
4. **Analyzing and Interpreting Data**
5. **Using Mathematics and Computational Thinking**
6. **Constructing Explanations and Designing Solutions**
7. **Engaging in Argument from Evidence**
8. **Obtaining, Evaluating, and Communicating Information**

Disciplinary Core Ideas

Earth and Space Sciences:
- Earth's Place in the Universe
- Earth's Systems
- Earth and Human Activity

Life Sciences:
- From Molecules to Organisms
- Ecosystems
- Heredity
- Biological Evolution

Physical Sciences:
- Matter and its Interactions
- Motion and Stability
- Energy and their Applications

Engineering, Technology and the Applications of Science:
- Engineering Design
- Links among Engineering Technology, Science and Society

Crosscutting Concepts

1. **Patterns**
2. **Cause and Effect**
3. **Scale, Proportion, and Quantity**
4. **Systems and System Models**
5. **Energy and Matter**
6. **Structure and Function**
7. **Stability and Change**

Scientific and Engineering Practices

NGSS@NSTA
STEM STARTS HERE

1. Asking questions (for science)
   and defining problems (for engineering)
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations (for science)
   and designing solutions (for engineering)
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

Disciplinary Core Ideas

NGSS@NSTA
STEM STARTS HERE

Life Science	Physical Science
LS1: From Molecules to Organisms: Structures and Processes LS2: Ecosystems: Interactions, Energy, and Dynamics LS3: Heredity: Inheritance and Variation of Traits LS4: Biological Evolution: Unity and Diversity	PS1: Matter and Its Interactions PS2: Motion and Stability: Forces and Interactions PS3: Energy PS4: Waves and Their Applications in Technologies for Information Transfer
Earth & Space Science	**Engineering & Technology**
ESS1: Earth's Place in the Universe ESS2: Earth's Systems ESS3: Earth and Human Activity	ETS1: Engineering Design ETS2: Links Among Engineering, Technology, Science, and Society

Core and Component Ideas

NGSS@NSTA STEM STARTS HERE

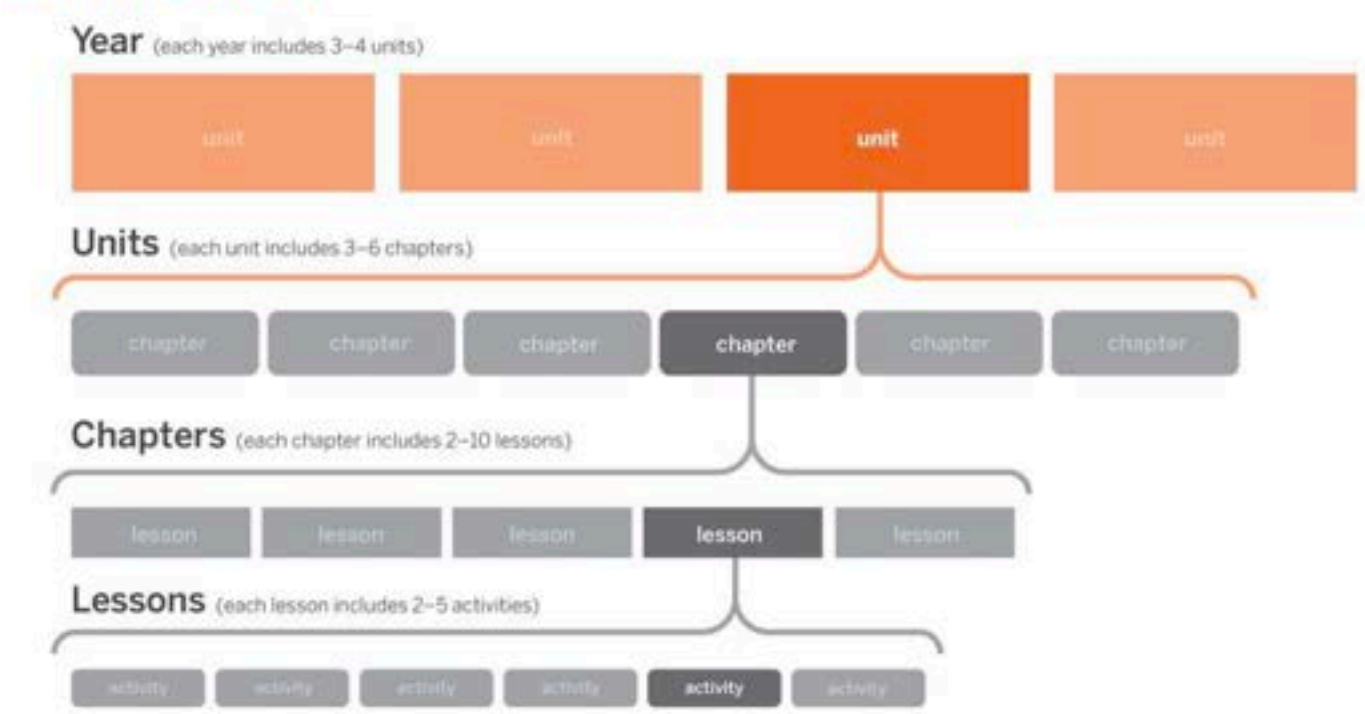
Life Science	Earth & Space Science	Physical Science	Engineering & Technology
LS1: From Molecules to Organisms: Structures and Processes LS1.A: Structure and Function LS1.B: Growth and Development of Organisms LS1.C: Organization for Matter and Energy Flow in Organisms LS1.D: Information Processing **LS2: Ecosystems: Interactions, Energy, and Dynamics** LS2.A: Interdependent Relationships in Ecosystems LS2.B: Cycles of Matter and Energy Transfer in Ecosystems LS2.C: Ecosystem Dynamics, Functioning, and Resilience LS2.D: Social Interactions and Group Behavior **LS3: Heredity: Inheritance and Variation of Traits** LS3.A: Inheritance of Traits LS3.B: Variation of Traits **LS4: Biological Evolution: Unity and Diversity** LS4.A: Evidence of Common Ancestry and Diversity LS4.B: Natural Selection LS4.C: Adaptation LS4.D: Biodiversity and Humans	**ESS1: Earth's Place in the Universe** ESS1.A: The Universe and Its Stars ESS1.B: Earth and the Solar System ESS1.C: The History of Planet Earth **ESS2: Earth's Systems** ESS2.A: Earth Materials and Systems ESS2.B: Plate Tectonics and Large-Scale System Interactions ESS2.C: The Roles of Water in Earth's Surface Processes ESS2.D: Weather and Climate ESS2.E: Biogeology **ESS3: Earth and Human Activity** ESS3.A: Natural Resources ESS3.B: Natural Hazards ESS3.C: Human Impacts on Earth Systems ESS3.D: Global Climate Change	**PS1: Matter and Its Interactions** PS1.A: Structure and Properties of Matter PS1.B: Chemical Reactions PS1.C: Nuclear Processes **PS2: Motion and Stability: Forces and Interactions** PS2.A: Forces and Motion PS2.B: Types of Interactions PS2.C: Stability and Instability in Physical Systems **PS3: Energy** PS3.A: Definitions of Energy PS3.B: Conservation of Energy and Energy Transfer PS3.C: Relationship Between Energy and Forces PS3.D: Energy in Chemical Processes and Everyday Life **PS4: Waves and Their Applications in Technologies for Information Transfer** PS4.A: Wave Properties PS4.B: Electromagnetic Radiation PS4.C: Information Technologies and Instrumentation	**ETS1: Engineering Design** ETS1.A: Defining and Delimiting an Engineering Problem ETS1.B: Developing Possible Solutions ETS1.C: Optimizing the Design Solution **ETS2: Links Among Engineering, Technology, Science, and Society** ETS2.A: Interdependence of Science, Engineering, and Technology ETS2.B: Influence of Engineering, Technology, and Science on Society and the Natural World ***Note**: In NGSS, the core ideas for Engineering, Technology, and the Application of Science are integrated with the Life Science, Earth & Space Science, and Physical Science core ideas*

Crosscutting Concepts

NGSS@NSTA
STEM STARTS HERE

1. Patterns
2. Cause and effect: Mechanism and explanation
3. Scale, proportion, and quantity
4. Systems and system models
5. Energy and matter: Flows, cycles, and conservation
6. Structure and function
7. Stability and change

K-5 Navigation structure



Unit Level resources

The Unit Level resources aim to quickly familiarize teachers with the unit's content, structure, and materials. It is recommended that teachers read through the Planning for the Unit documents, and consult the Teacher References as necessary. Some of the Unit Level resources include:

Planning for the Unit

Unit Overview	Describes what's in each unit and how students learn across chapters
Unit Map	An overview of what students figure out by chapter and how they figure it out
Progress Build	Explains the learning progression of ideas students figure out in the unit
Materials and Preparation	Lists materials included in the unit's kit, items to be provided by the teacher, and briefly outlines preparation requirements for each lesson
Science Background	Adult-level primer on the science content students figure out in the unit

Teacher References

Lesson Overview Compilation	Lesson Overview of each lesson in the unit, including lesson summary, activity purposes, and timing
3-D Statements	Describes 3-D learning across the unit, chapters, and in individual lessons
Assessment System	Describes components of the Amplify Science Assessment System
Embedded Formative Assessments	Includes full text of formative assessments in the unit
Books in This Unit	K-5: Summarizes each unit text and explains how the text supports instruction
Articles in This Unit	6-8: Summarizes each unit text and explains how the text supports instruction
Apps in This Unit	2-8: Outlines functionality of digital tools and how students use them

Printable Resources

Coherence Flowcharts	Visualization of how all of the different parts of a chapter connect and flow into one another so that students are able to figure out the unit phenomenon
Investigation Notebook	Digital version of the Investigation Notebook, for copying and projecting. The PDFs are fillable, so students can also complete their work digitally.
Article Compilation	6-8: Downloadable PDF with all of the unit's science articles in one document
Copymaster Compilation	Downloadable PDF with all of the unit's copymasters in one place
Print Materials	A digital copy of the Print Materials included in the Unit Kit

Unit Map

How can learning about how grove snails survive help engineers design effective solutions to problems?

In their role as biomimicry engineers, students figure out how the traits of grove snails affect their survival in different environments. They apply that understanding as they explore other organisms, their traits, and the likelihood of survival in different environments. Students then design effective solutions to the problem of invasive plant removal using the structural traits of giraffes as inspiration.

Chapter 1: Why are the snails with yellow shells not surviving well?

Students figure out: In a specific snail population, the snails with yellow shells are less likely to survive because it is harder for them to avoid song thrush birds in their environment. Organisms are more likely to survive if they can meet their needs in their environment, and avoiding predators is one of those needs. The snails with yellow shells are less able to avoid being eaten by the birds, so they are less likely to survive.

How they figure it out: Students imagine that they are different organisms and consider whether they will be able to survive in different environments. They read a book about how earthworms meet their needs for survival and collect data in a board game to understand why organisms are more likely or less likely to survive in different environments. After analyzing data about the snails' environment, they write their first scientific explanation.

Chapter 2: Why are the snails with banded shells more likely to survive than the snails with yellow shells?

Students figure out: Snails with banded shells are more likely to survive because their shells blend in with the environment. The snails live in an environment with brown grass, so it's harder for birds to see snails with banded shells. Another reason snails with banded shells are more likely to survive is that banded shells are stronger than yellow shells. Since birds need to crack the shell in order to eat the snail, snails with the stronger banded shells are more likely to survive.

How they figure it out: Students explore variation in traits within a species and use a physical model to collect data about how different traits affect whether organisms can meet their needs for survival in their environment. They read a book about animal mouth structures and investigate fossil structures so they can make inferences about the function of these structures. Students analyze new data from the snails' environment and write an explanation about why banded-shell snails are more likely to survive. They conclude the chapter by planning a design inspired by their knowledge of grove snails' adaptive traits.

Chapter 3: Why were snails with yellow shells more likely to survive in their environment 10 years ago?

Students figure out: Snails with yellow shells were more likely to survive in the past because their yellow color was an adaptive trait in their former environment. That area used to be sandy, so the snails with yellow shells blended in against the yellow sand. When the environment changed from sandy to brown grass, the yellow color became a non-adaptive trait; it is easier for birds to see the yellow snails against the brown grass.

How they figure it out: Students receive new data about changes in the snails' environment. They engage in a classroom model to explore how the survival of organisms with different traits is affected by changes in the organisms' environment. They read about examples of environmental changes and how each change determined which organisms were likely to survive. Students create models and address the misconception that organisms can decide to change their traits. They write explanations about why snails with yellow shells were more likely to survive.

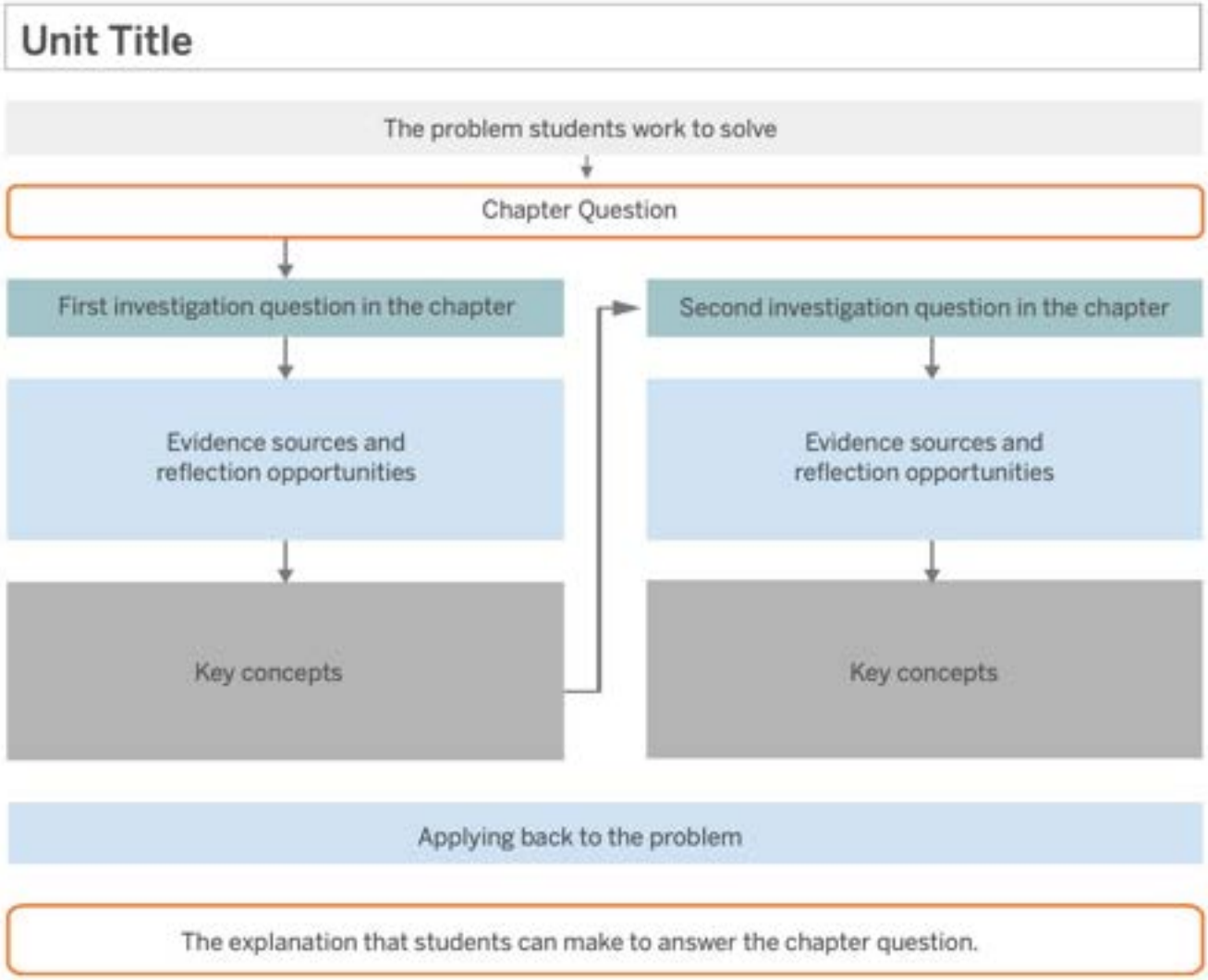
Chapter 4: How can engineers use what they learn from organisms' traits to design solutions?

Students figure out: Through the practice of biomimicry, engineers observe different organisms to understand the functions of their traits and get ideas that can help them design solutions to problems. They make a design, test it to see how well it meets the design criteria, and revise the design to make it better.

How they figure it out: Students respond to a design challenge where they apply their understanding of how structures allow organisms to carry out different functions. They read about engineers who use biomimicry to design a robot that is inspired by cockroach traits. Students then design a robot for removing invasive plants that is inspired by giraffe traits. Students plan and build design prototypes, test them with a physical model and a digital app, and revise their designs. Students present an evidence-based argument about how well their designs meet the criteria.

Coherence Flowchart structure

Typical structure of one chapter in a Coherence Flowchart



Instruction is framed by questions about the unit's anchor phenomenon and the related problem students are solving. Chapter Questions then guide students in figuring out the phenomenon, piece by piece. Within each chapter, Investigation Questions focus students on a manageable piece of content that will help them figure out the Chapter Question. Each question motivates activities, and each activity provides specific evidence related to the Investigation Question. Students synthesize the understanding constructed over multiple activities, and this understanding is formalized through key concepts. Often a key concept leads students to an additional Investigation Question students need to pursue to answer the Chapter Question. At the end of the chapter, students' new understanding is applied back to the unit's anchor phenomenon and leads students to a new Chapter Question or a final explanation.

Environments and Survival: Snails, Robots, and Biomimicry

Unit Design Problem

Problem students work to solve

We want to use what we learn about grove snails to design effective solutions to problems.
How can learning about how grove snails survive help engineers design effective solutions to problems?

Chapter-level Anchor Phenomenon
Chapter 1 Question

The number of snails with yellow shells now is smaller than it was 10 years ago.
Why are snails with yellow shells not surviving well?

Investigation Question

What makes organisms in a population more likely to survive or less likely to survive? (1.2—1.4)
(Note: See Lesson Overviews for lesson-level Investigative Phenomena)

Evidence sources and reflection opportunities

- Investigate organisms' survival needs (1.2)
- Make inferences about organisms' likelihood to survive in different environments (1.2)
- Read *Earthworms Underground* (1.3)
- Discuss how traits can help organisms survive (1.3)
- Use Concept Mapping routine to discuss relationships among concepts (1.3)
- Use the Survival Mode to investigate how environment affects an organism's likelihood of survival (1.4)
- Use the Data Tool to graph population change in the Survival Model, then analyze the data (1.4)
- Think-Pair-Share about the Survival Model (1.4)

Key concepts

- When it's easy for organisms to meet their needs in their environment, they are likely to survive. (1.4)
- When it's hard for organisms to meet their needs in their environment, they are not likely to survive. (1.4)

Application of key concepts to the problem

- Use data about grove snails' environment to make inferences about their likelihood of survival (1.5)
- Shared write an explanation to answer the Chapter 1 Question (1.5)

Explanation that students can make to answer the Chapter 1 Question

In a specific snail population, the snails with yellow shells are less likely to survive because it is harder for them to avoid song thrush birds in their environment. Organisms are more likely to survive if they can meet their needs in their environment, and avoiding predators is one of those needs. The snails with yellow shells are less able to avoid being eaten by the birds, so they are less likely to survive.

Classroom Slides reference

Classroom Slides are a resource designed to make planning and teaching with Amplify Science faster and easier. Each lesson has editable slides optimized for **Microsoft PowerPoint Version 16 and Google** to help guide teachers and their students through the lesson with easy-to-follow images, videos, questions, and instructions.

This reference sheet has basic information to get you started. For a more in-depth how-to? Go to: https://tinyurl.com/amplifyslideshowto

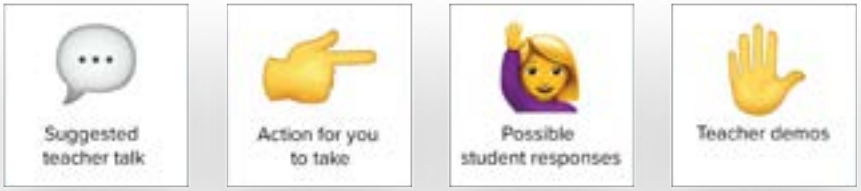
Helpful tips:

The text on the slides is color coded! Black text on the slides denotes suggested teacher talk. Orange text on the slides denotes a student action.

Icons on the slide cue the teacher about what is happening in the lesson. Here's what the icons on the slides mean:

You may occasionally also come across the following student action icons:

In addition to the text and visuals on the slide, each slide's notes field contains additional information, including possible student responses, follow-up prompts, and instructional steps. In most cases, the content on the slide is meant to come before the actions and suggested teacher talk written in the notes. Here's what the icons in the notes field mean:



Unit level internalization notes

Lesson level internalization notes

Additional Amplify resources

Program Guide

Additional insight into the program's structure, intent, philosophies, supports, and flexibility.

https://my.amplify.com/programguide

California Edition:
http://amplify.com/science/california/review

Louisiana Edition:
https://my.amplify.com/programguide/content/louisiana/welcome/elementary-school/

Amplify Help

Frequently updated compilation of articles with advice and answers from the Amplify team.

my.amplify.com/help

Caregivers Site

https://amplify.com/amplify-science-family-resource-intro/

Amplify Support

Contact the Amplify support team for information specific to enrollment and rosters, technical support, materials and kits, and teaching support, weekdays 7AM-10PM EST and weekends 10AM-6PM EST.

Email: help@amplify.com

Email: edsupport@amplify.com (pedagogical questions)

Phone: 800-823-1969

Or, reach Amplify Chat by clicking the  icon at the bottom right of the digital Teacher's Guide.

When contacting the support team:

- Identify yourself as an Amplify Science user.
- Note the unit you are teaching.
- Note the type of device you are using (Chromebook, iPad, Windows, laptop).
- Note the web browser you are using (Chrome or Safari).
- Include a screenshot of the problem, if possible. Copy your district or site IT contact on emails.

Amplify Science