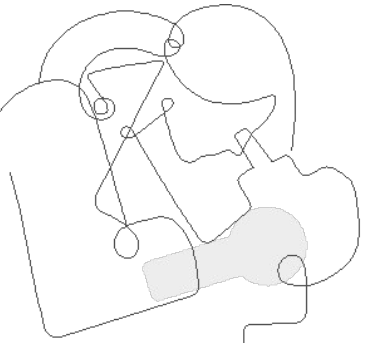
Amplify Science

Energy Conversions Unit Deep Dive

Grade 4



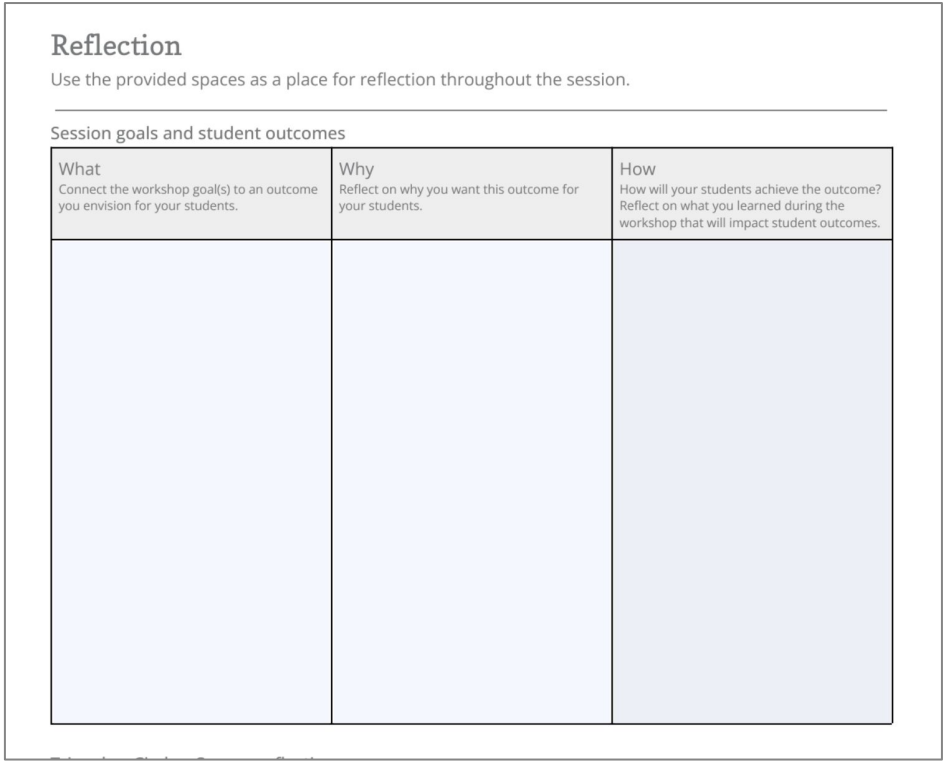
LAUSD
Date: September, 2023
Presented by

PLPG CERTIFIED PROVIDER

Opening Reflection

What are your goals for student outcomes as a result of attending this professional workshop?

Participant Notebook



Reflection

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

Session goals and student outcomes

What	Why	How
Connect the workshop goal(s) to an outcome you envision for your students.	Reflect on why you want this outcome for your students.	How will your students achieve the outcome? Reflect on what you learned during the workshop that will impact student outcomes.

Name

Amplify Facilitator

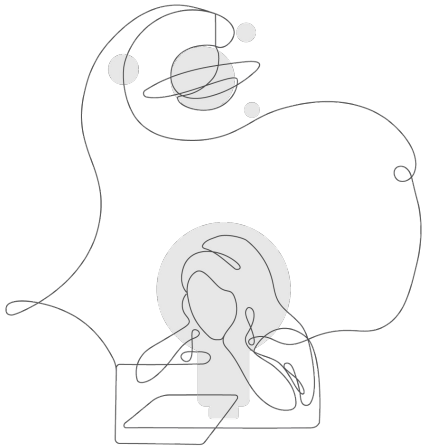
- Add your experience here.
-
-

[Insert Photo]

For an easy way to do it:

- Right click on **this** image.
- Click “Replace Image.”
- Choose how you’ll upload your image.
- Reposition your photo if necessary.

Please write your name on the index card.



Amplify's Purpose Statement

Dear teachers,

You do a job that is nearly impossible and **utterly essential.**

We are in your corner – extending your reach, saving you time, and enhancing your understanding of each student.

Thank you for working with us to craft rigorous and riveting learning experiences for your classroom.

We share your goal of **inspiring all students to think deeply, creatively, and for themselves.**

Sincerely,
Amplify

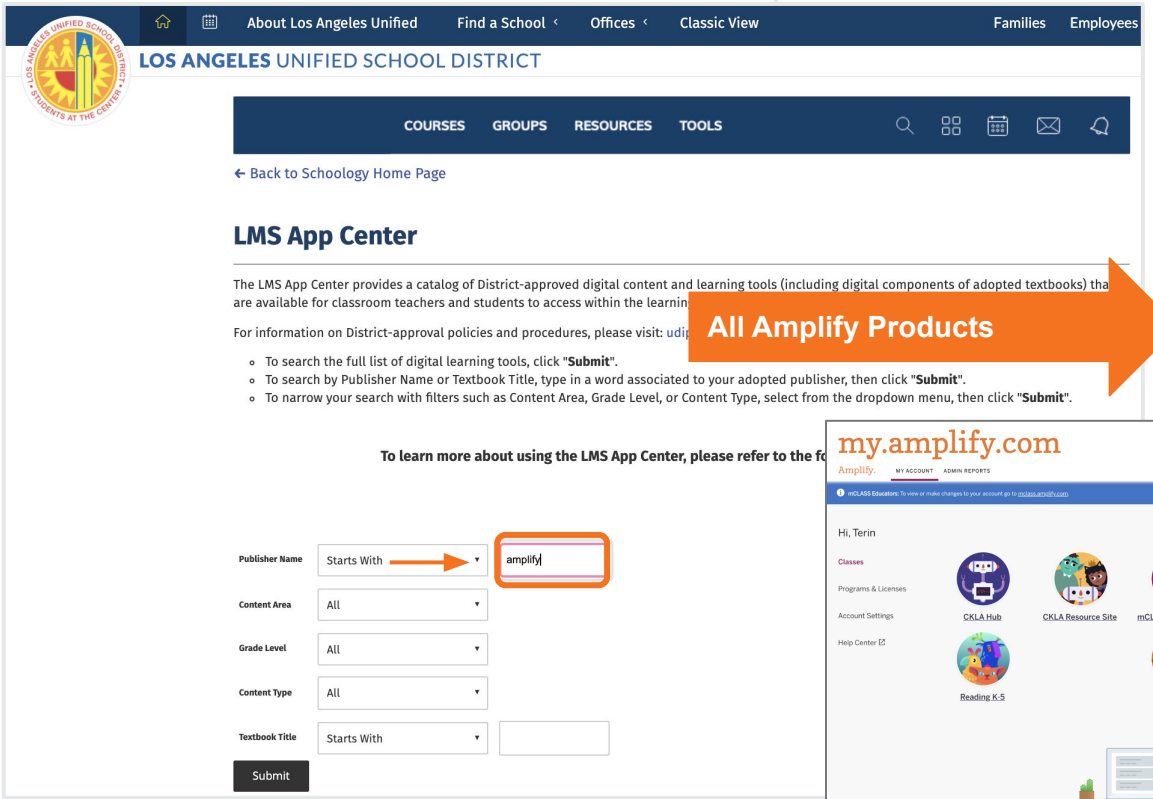
Norms: Establishing a culture of learners

- **Take risks:** Ask any questions, provide any answers.
- **Participate:** Share your thinking, participate in discussion and reflection.
- **Be fully present:** Unplug and immerse yourself in the moment.
- **Physical needs:** Stand up, get water, take breaks.

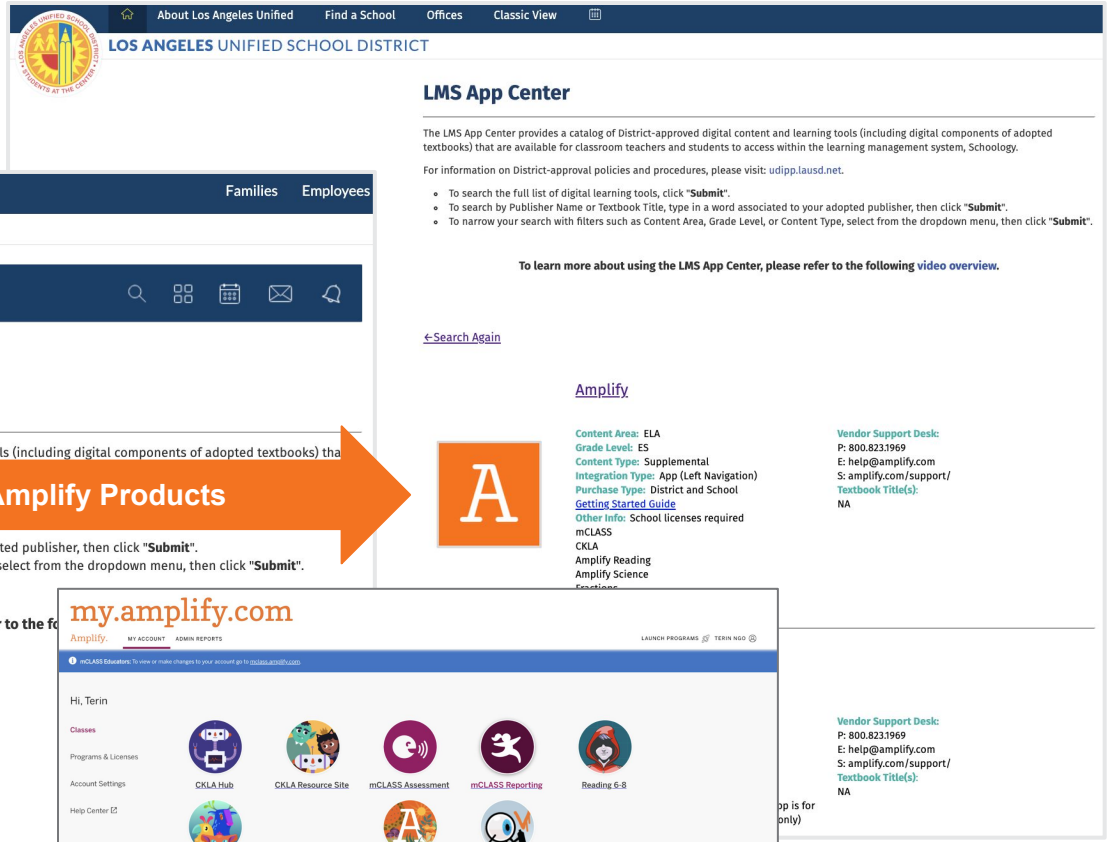
Today's Logistics

- Lunch break from 11:30 - 12:30
- The day ends at 3:00
- Please be sure to sign in
- Bathrooms
- Parking lot for questions or concerns
- If you need to stand, feel free to but please stay engaged

Schoology



All Amplify Products



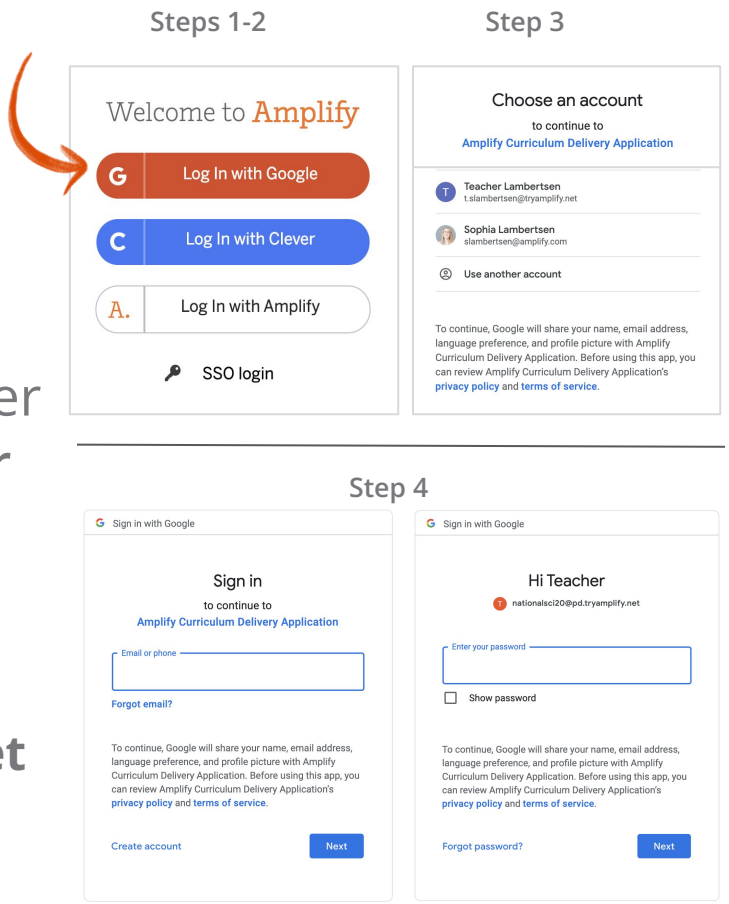
Join Amplify Science Schoology Group

To join Amplify Science Schoology ES Group: W4PK-W466-63F5B

Logging in (demo account)

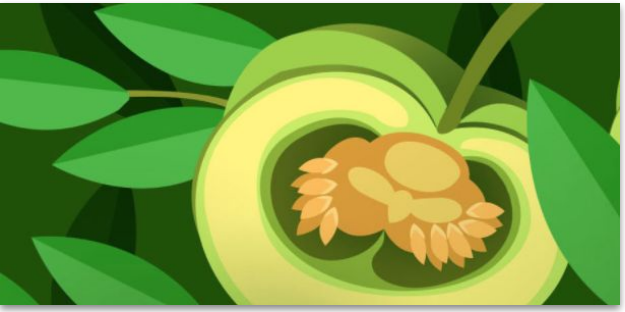
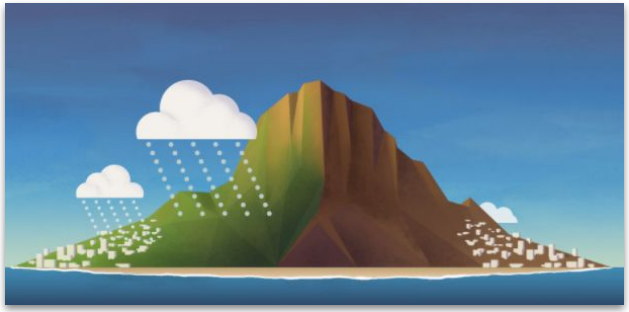
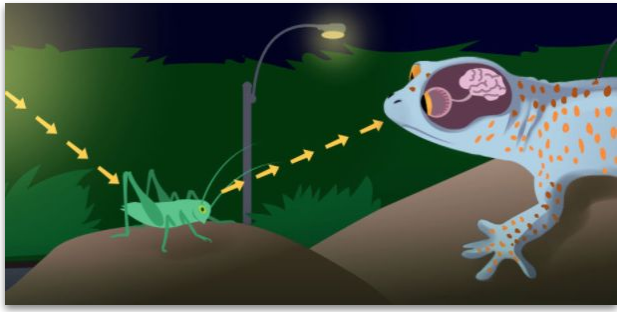
Safari or Chrome

1. Go to **learning.amplify.com**
2. Select **Log in with Google**
3. If you're already logged in with other Google accounts, click **Use another account**
4. Enter teacher demo account credentials
   - **californiasci__@pd.tryamplify.net**
   - Password: **AmplifyNumber1**



LAUSD SUMMER INSTITUTE 2023

Session 1
Unit 1 Deep Dive

Plan for the day

- Introduction and framing
- Unit Internalization
- Digging into Chapter 1
- Model Lesson
- Digging into Chapter 2
- Planning
- Closing

Ice Breaker!

Who do we have in the room today?

- Name & School
- Have you taught Amplify Science before and if so, for how long?
- What are your goals for student outcomes after attending this student workshop today?

Navigation Temperature Check

Rate yourself on your comfort level accessing Amplify Science materials and navigating a digital curriculum.

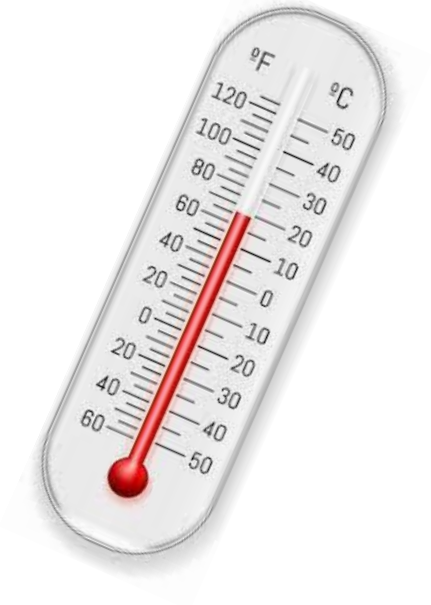
1 = Extremely Uncomfortable

2 = Uncomfortable

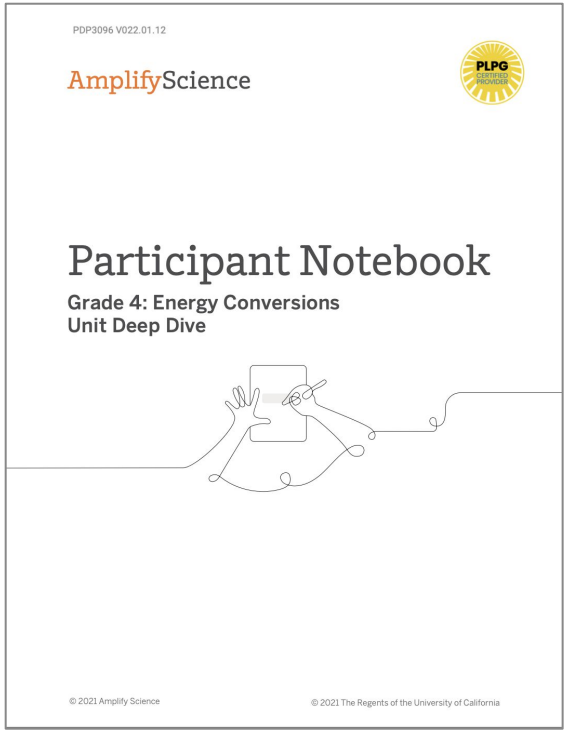
3 = Mild

4 = Comfortable

5 = Extremely Comfortable



Participant Notebook



Hardcopy and digital

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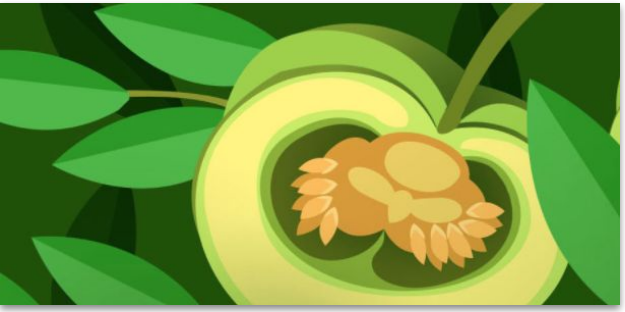
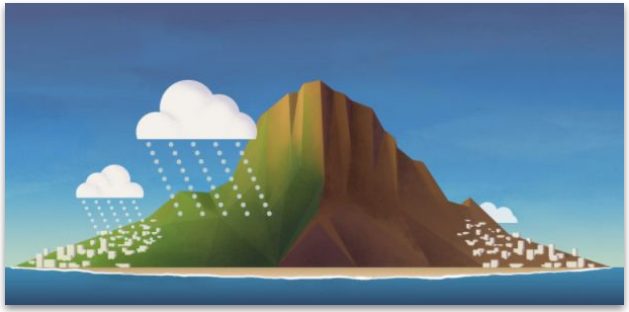
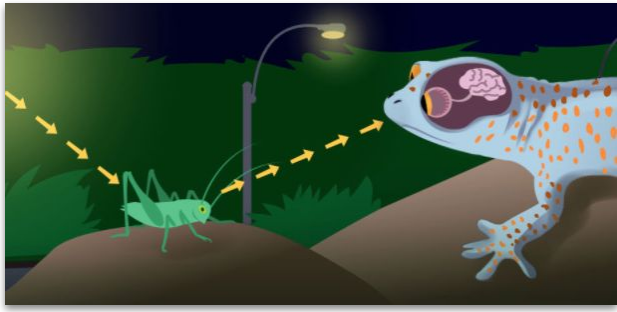




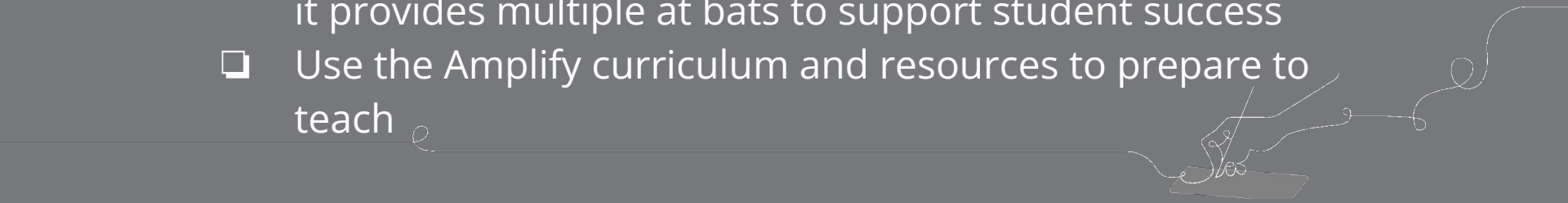
Plan for the day

- Introduction and framing
- Unit Internalization
- Digging into Chapter 1
- Model Lesson
- Digging into Chapter 2
- Planning
- Closing

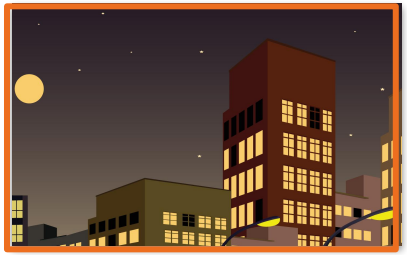
Goals for the day:

By the end of the day, you will:

- ❑ Experience how all the instructional components fit together in the context of the unit
- ❑ Gain a deeper understanding of the purposeful sequencing of each activity and lesson within a chapter
- ❑ Become more familiar with multimodal instruction and how it provides multiple at bats to support student success
- ❑ Use the Amplify curriculum and resources to prepare to teach



Year at a Glance: Grade 4

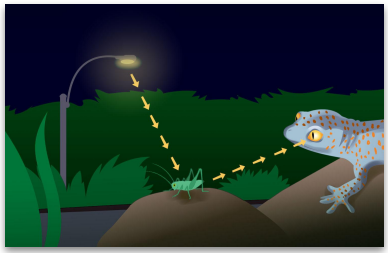


Energy Conversions

Domain: Physical Science

Unit type: Engineering Design

Student role: System engineers

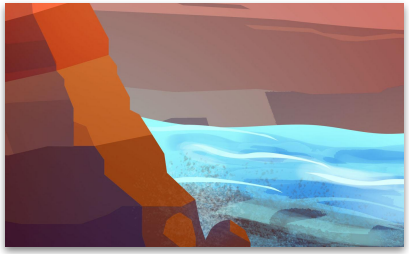


Vision and Light

Domain: Life Science

Unit type: Investigation

Student role: Conservation biologists

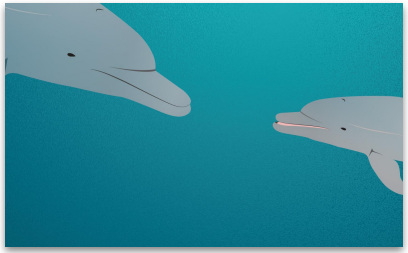


Earth's Systems

Domain: Earth and Space Science

Unit type: Argumentation

Student role: Geologists



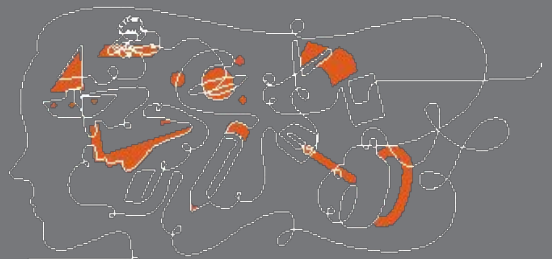
Waves, Energy, and Information

Domain: Physical Science

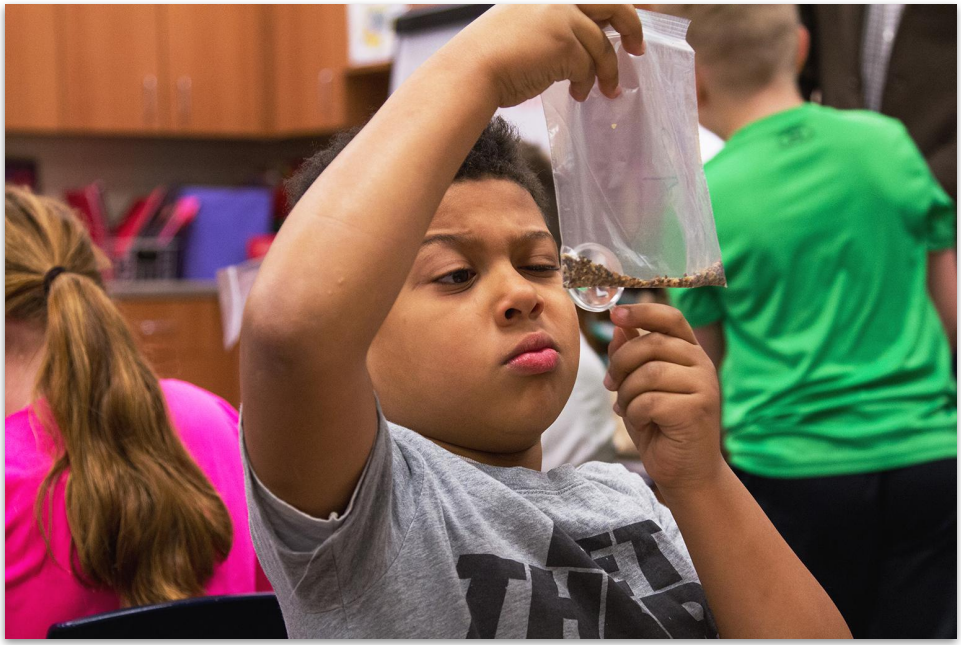
Unit type: Modeling

Student role: Marine scientists

Unit Overview



Phenomenon based learning



Phenomenon-based learning and teaching

A scientific phenomenon is an **observable event** that occurs in the universe that we can use science ideas to explain or predict.

Comparing topics and phenomena

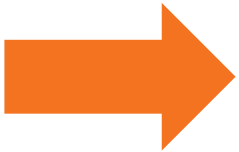
Topic-based	Phenomenon-based
Ocean habitats	A sea turtle can survive in an ocean habitat where sharks live

Comparing topics and phenomena

A shift in science instruction

from learning about

(like a student)



to figuring out

(like a scientist)

Phenomena-based Instruction

Inquire like a scientist.

Think like a scientist.

Quantify like a scientist.

Read like a scientist.

Talk like a scientist.

Write like a scientist.

Critique like a scientist.

Argue like a scientist.

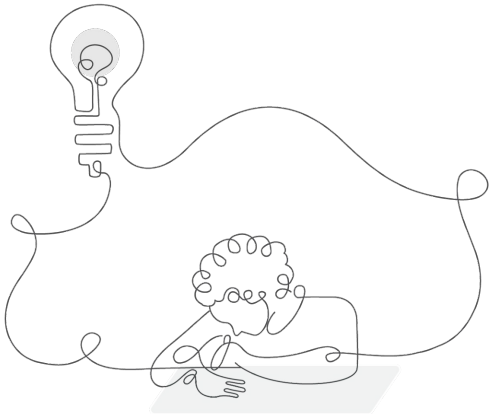
Figuring out phenomena like a scientist.

Previewing the unit

Introducing the phenomenon

Amplify Science units are designed around complex phenomena that drive student learning through the unit.

Let's look at the phenomenon, or observable event, students will figure out in your unit.



Energy Conversions

Grade 4

AmplifyScience

The unit we're beginning is called *Energy Conversions: Blackout in Ergstown*.

In this unit, you will **investigate why blackouts occur and come up with solutions to prevent them**.

Ergstown

This picture shows a town we'll call Ergstown.

What do you **see** in the picture?

Ergstown: a Few Moments Later

This is an image of the same town just a few moments later.

How is this picture different?

What do you think is going on in the picture?

Ergstown: Later That Night

What do you notice in this picture?

To: Systems Engineers
From: Mayor Joules, Ergstown City Hall
Subject: Improvements to the Electrical System

Recently, Ergstown has been experiencing frequent blackouts. Blackouts can be dangerous and inconvenient, so I need a team to figure out how the electrical system can be improved.

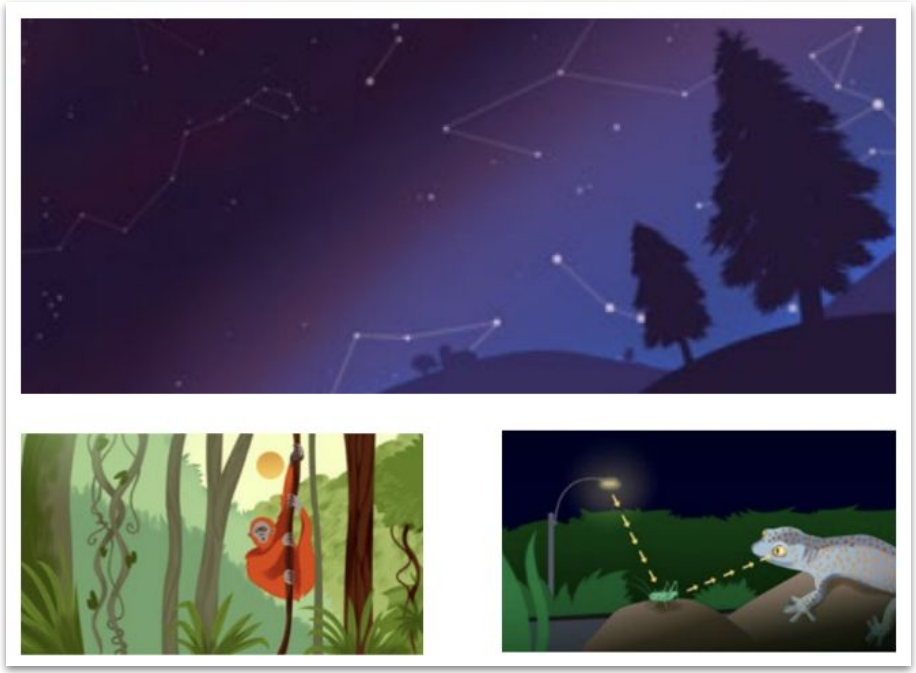
Before the team can begin to solve this problem, it will first need to figure out why the blackouts have been happening. I would like to receive updates as the team discovers possible causes of the blackouts and as the team comes up with ideas about how to improve the electrical system.

The town of Ergstown will be very grateful to anyone who can help us solve our blackout problem!

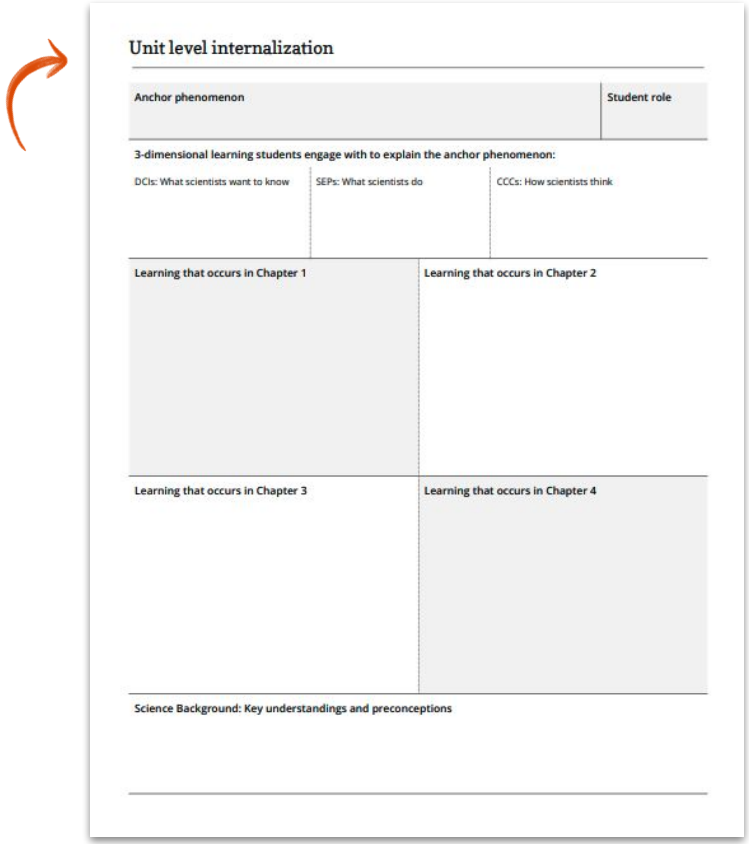
Amplify Science

Anchoring phenomenon

- Complex and rich
- Drives learning through a whole unit
- Specific and observable
- Relatable at students' developmental level



Unit Overview



Unit level internalization

Anchor phenomenon	Student role

3-dimensional learning students engage with to explain the anchor phenomenon:

DCIs: What scientists want to know	SEPs: What scientists do	CCCs: How scientists think

Learning that occurs in Chapter 1	Learning that occurs in Chapter 2

Learning that occurs in Chapter 3	Learning that occurs in Chapter 4

Science Background: Key understandings and preconceptions

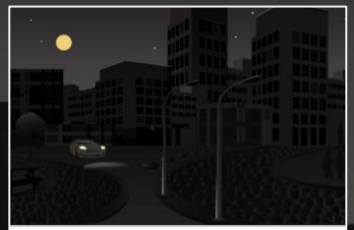
Energy Conversions

Problem: Why does Ergstown keep having blackouts?

Role: Systems Engineers

A power failure is a real-life lesson in how much our society relies on electrical energy. Through this unit, students will better understand the parts of the electrical system and how vital it is to modern life.

Coherent Storylines

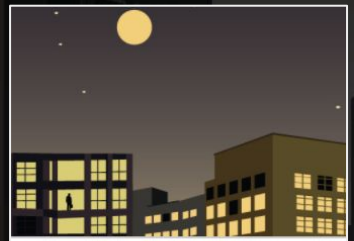


Chapter 1: What happened to the electrical system the night of the...

6 Lessons

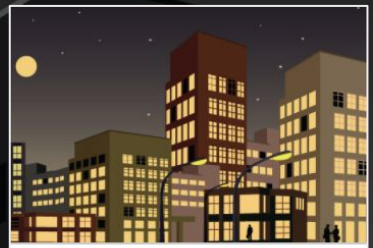
Chapter 2: What makes the devices in Ergstown output or fail to output...

4 Lessons



Chapter 3: Where does the electrical energy for the devices in Ergstow...

6 Lessons

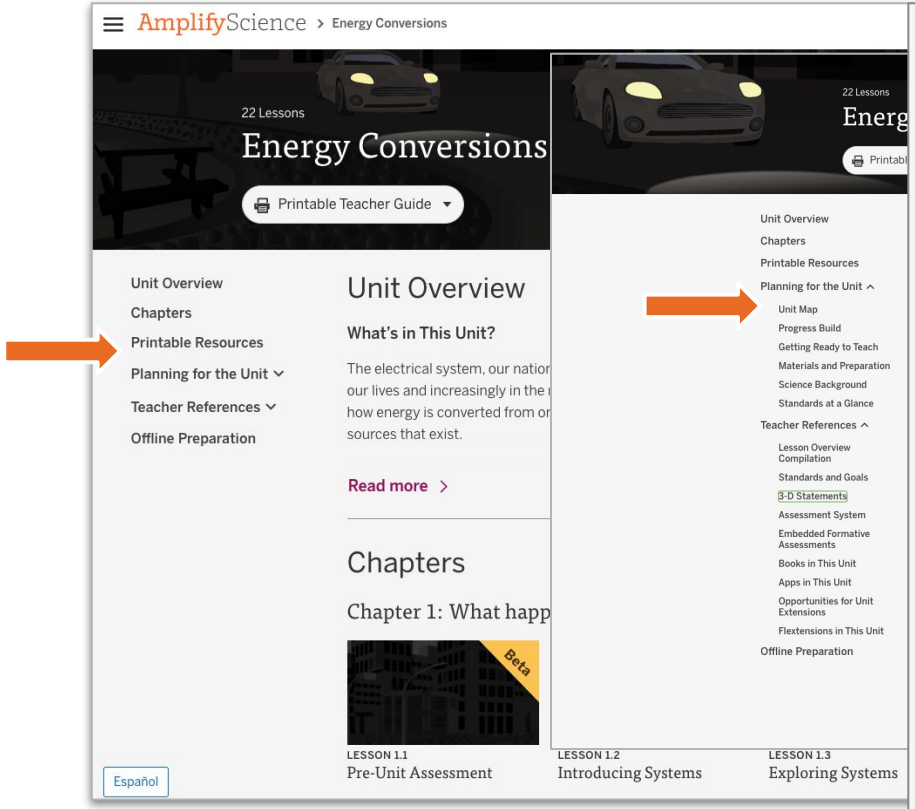


Chapter 4: How does energy get to the devices all over Ergstown?

6 Lessons

AmplifyScience

Navigating to the Unit Map



Unit Map

Why does Ergstown keep having blackouts?

Students take on the role of systems engineers for Ergstown, a fictional town that experiences frequent blackouts, and explore the reasons why an electrical system can fail. Students apply what they learn to choosing new energy sources and energy converters for the town, and then they prepare arguments for why their design choices will make the town's electrical system more reliable.

Chapter 1: What happened to the electrical system the night of the Ergstown blackout?

Students figure out: The devices stopped working in Ergstown because they weren't able to get electrical energy from the electrical system. To convert energy to light, heat, motion, or sound, devices need to be plugged into the wall and receive electrical energy. During the blackout, the devices weren't getting this electrical energy.

How they figure it out: Students investigate several different systems, including a simple circuit powered by a solar cell. They review evidence from the blackout and make an argument about what they think caused the blackout.

Chapter 2: What makes the devices in Ergstown output energy or fail to output energy?

Students figure out: Energy isn't created or destroyed. Devices can convert electrical energy to light, heat, motion, or sound when they get electrical energy because these are all forms of energy. When all the devices were running, they caused a blackout. The devices needed more energy from the electrical system than was available. Either the town was using too many devices, or the devices were not energy efficient. If more energy is needed from the electrical system than is available, a blackout can occur.

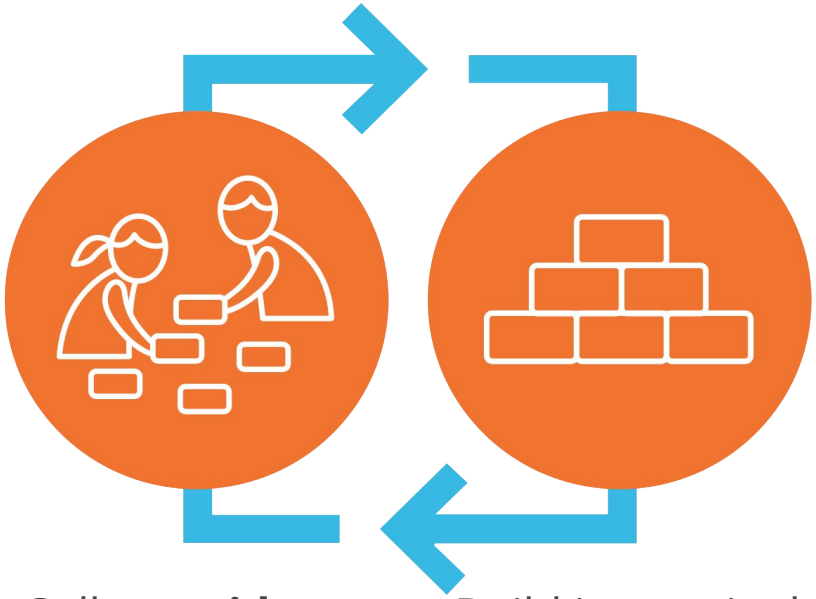
How they figure it out: Using the *Energy Conversions* Simulation, students explore different ways to convert energy from one form to another. They consider the relationship between the amount of energy used and the amount of energy in the electrical system. Finally, students write their first argument for how to solve the problem of blackouts in Ergstown.

Chapter 3: Where does the electrical energy for the devices in Ergstown come from?

Students figure out: Electrical energy that comes through the electrical grid must have a source and a source converter. There are many possible sources, such as fossil fuels, wind, water, and sunlight. Each source has a converter that changes the energy form of the source to electrical energy. Energy use in Ergstown could have caused a blackout if there wasn't enough energy coming from the source, there weren't enough source converters to convert energy from the source, or the source converters were broken.

Amplify Science Approach

Why does Ergstown keep having blackouts?



How can we solve Ergstown's blackout problem?

Introduce a **phenomenon** and a related problem

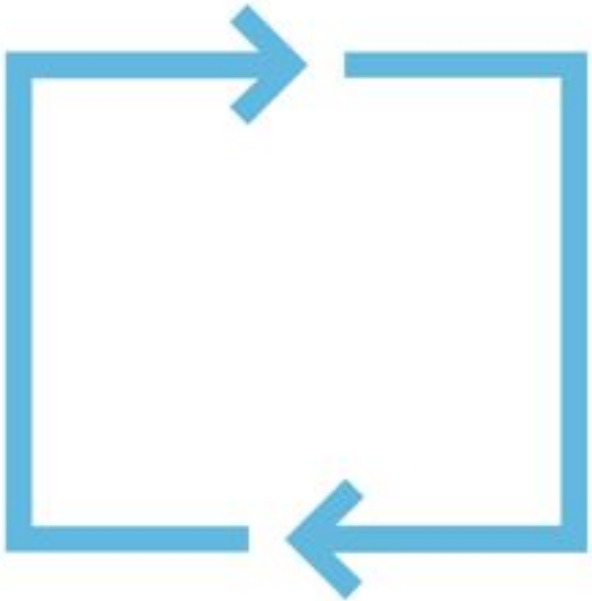
Collect **evidence** from multiple sources

Build increasingly complex **explanations**

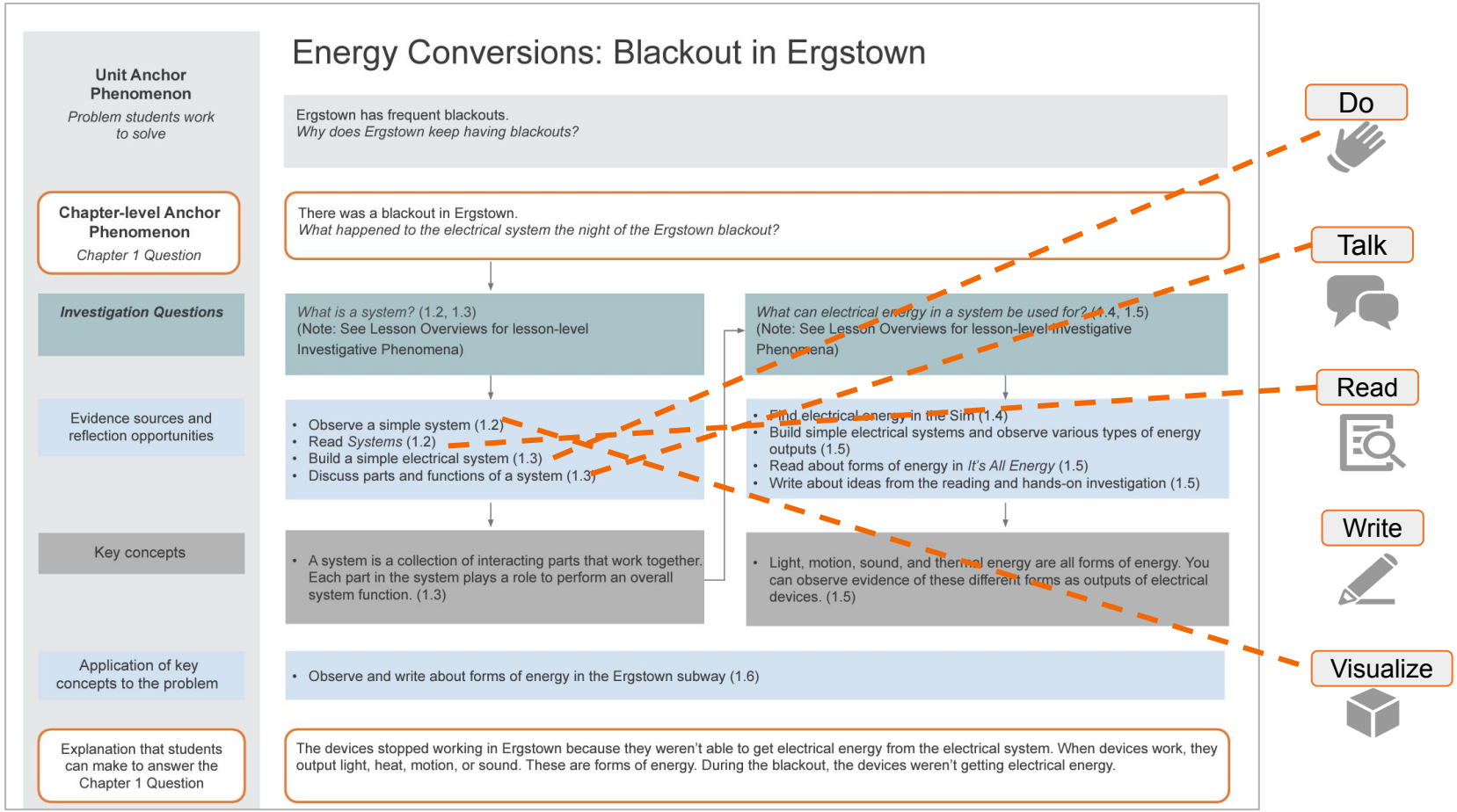
Apply knowledge to solve the design problem

Multimodal instruction

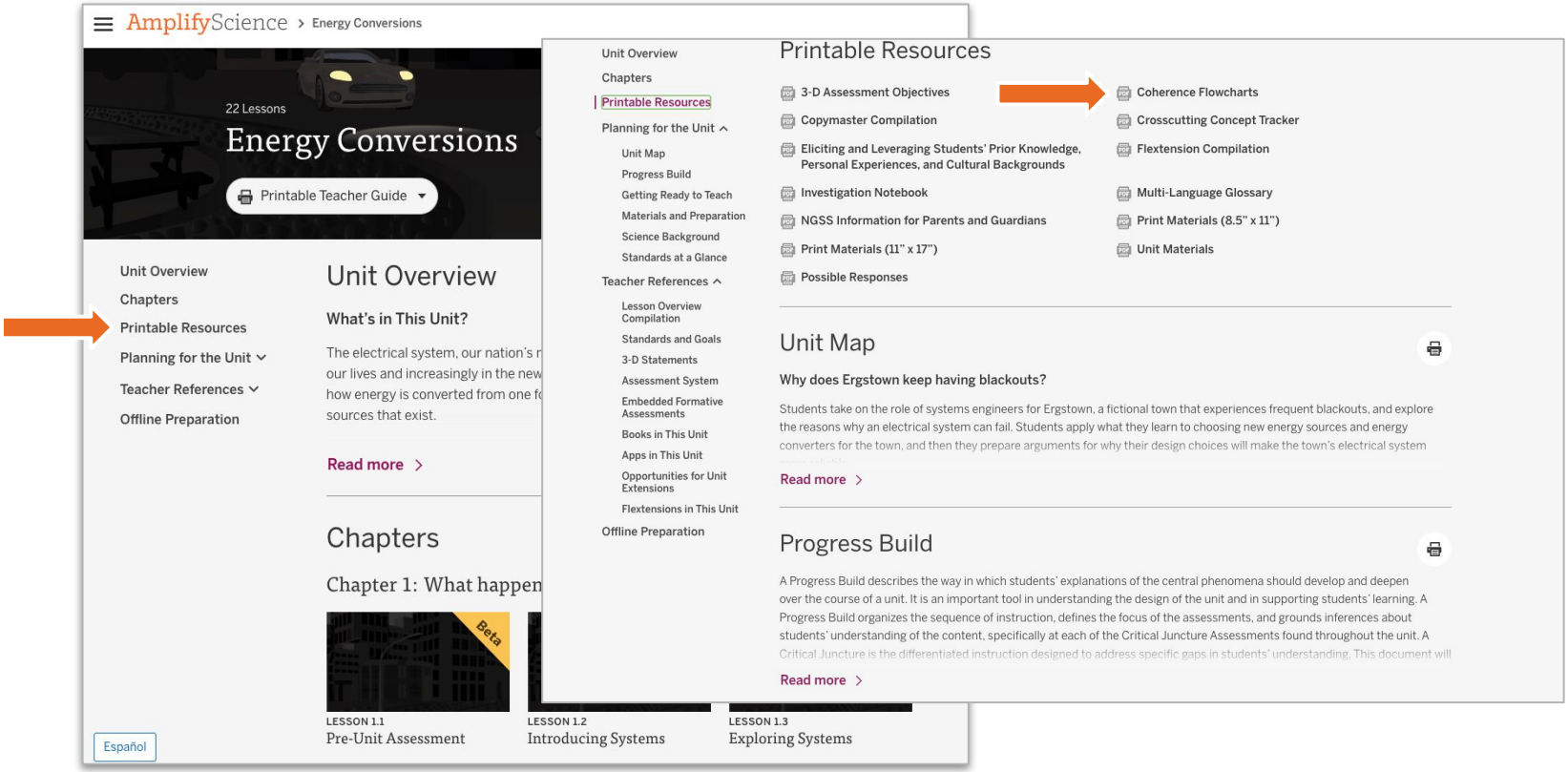
For each key concept, students w
with evidence in varied modalities



Do,
Talk,
Read,
Write,
Visualize


Energy Conversions: Blackout in Ergstown
Unit Anchor Phenomenon
Problem students work to solve
Ergstown has frequent blackouts.
Why does Ergstown keep having blackouts?
Chapter-level Anchor Phenomenon
Chapter 1 Question
There was a blackout in Ergstown.
What happened to the electrical system the night of the Ergstown blackout?
Investigation Questions
What is a system? (1.2, 1.3)
(Note: See Lesson Overviews for lesson-level Investigative Phenomena)
What can electrical energy in a system be used for? (1.4, 1.5)
(Note: See Lesson Overviews for lesson-level Investigative Phenomena)
Evidence sources and reflection opportunities
Observe a simple system (1.2)
Read Systems (1.2)
Build a simple electrical system (1.3)
Discuss parts and functions of a system (1.3)
Find electrical energy in the Sim (1.4)
Build simple electrical systems and observe various types of energy outputs (1.5)
Read about forms of energy in It's All Energy (1.5)
Write about ideas from the reading and hands-on investigation (1.5)
Key concepts
A system is a collection of interacting parts that work together. Each part in the system plays a role to perform an overall system function. (1.3)
Light, motion, sound, and thermal energy are all forms of energy. You can observe evidence of these different forms as outputs of electrical devices. (1.5)
Application of key concepts to the problem
Observe and write about forms of energy in the Ergstown subway (1.6)
Explanation that students can make to answer the Chapter 1 Question
The devices stopped working in Ergstown because they weren't able to get electrical energy from the electrical system. When devices work, they output light, heat, motion, or sound. These are forms of energy. During the blackout, the devices weren't getting electrical energy.
Do
Talk
Read
Write
Visualize

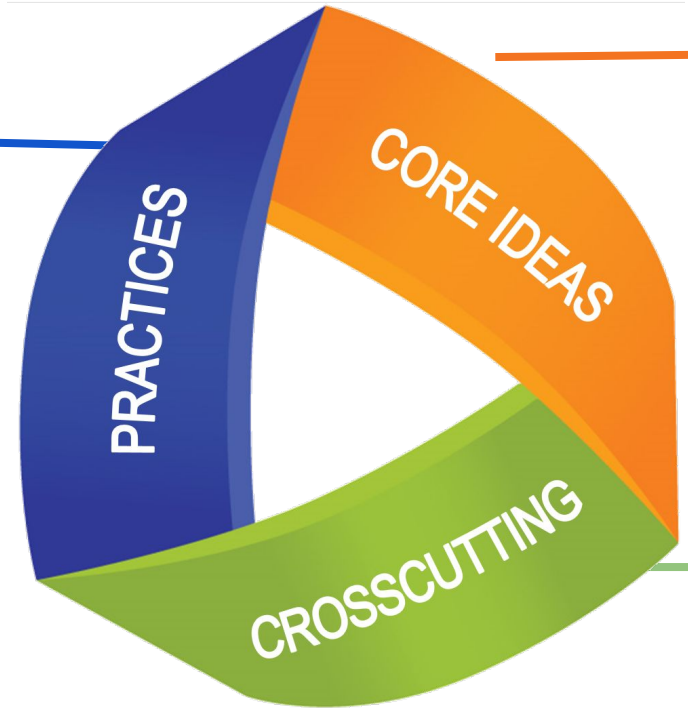
Navigating to the Coherence Flowchart



Patterns of Earth and Sky & NGSS

Using 3-D teaching and learning for figuring out phenomena

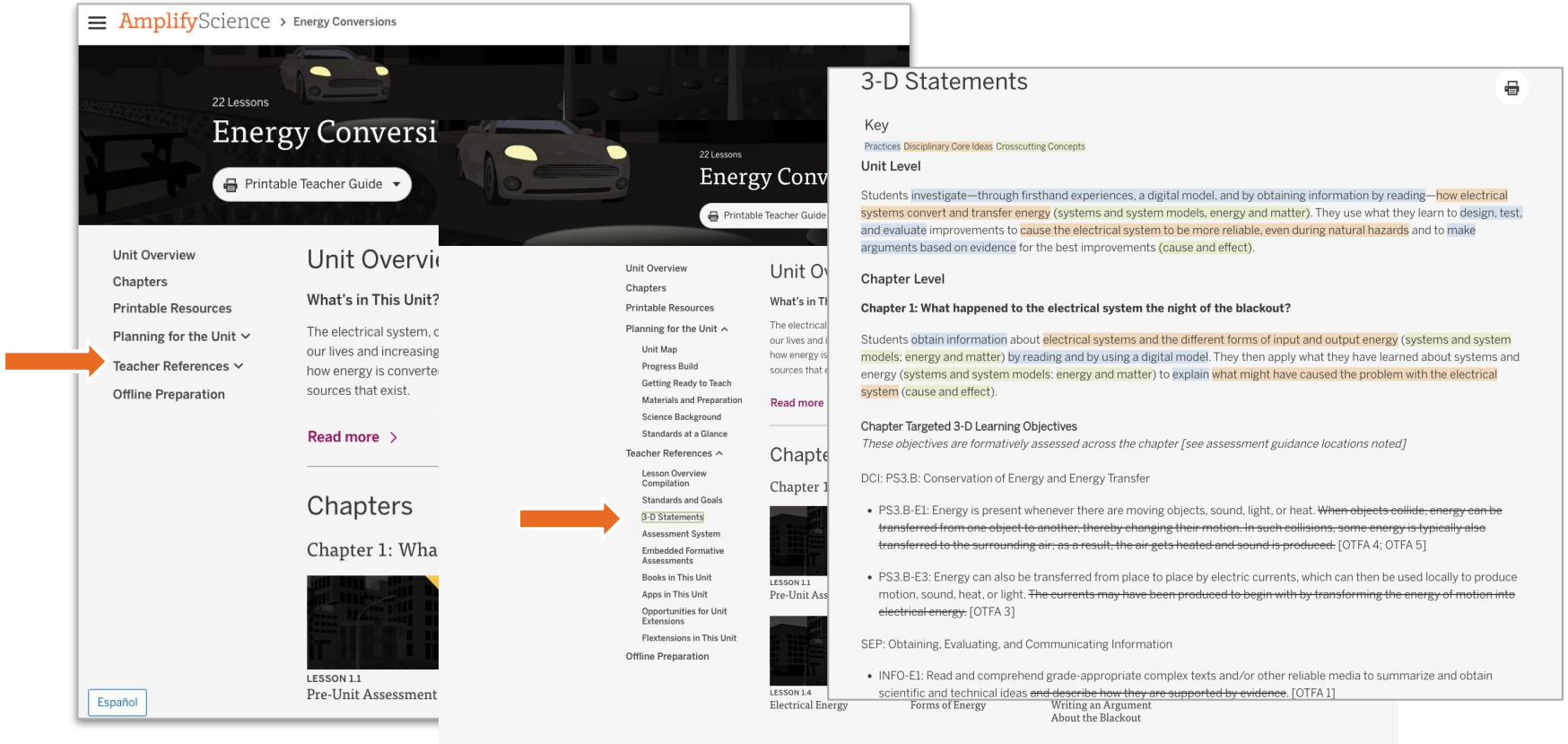
What scientists do
Science and Engineering Practices



What scientists want to know
Disciplinary Core Ideas

How scientists think
Crosscutting Concepts

Navigating to the 3-D Statements



Disciplinary Core Ideas: Energy Conversions

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

Science and Engineering Practices Energy Conversions

inquiry

1. Asking questions (for science) and defining problems (for engineering)
2. Developing and using models
3. Planning and carrying out investigations ✔

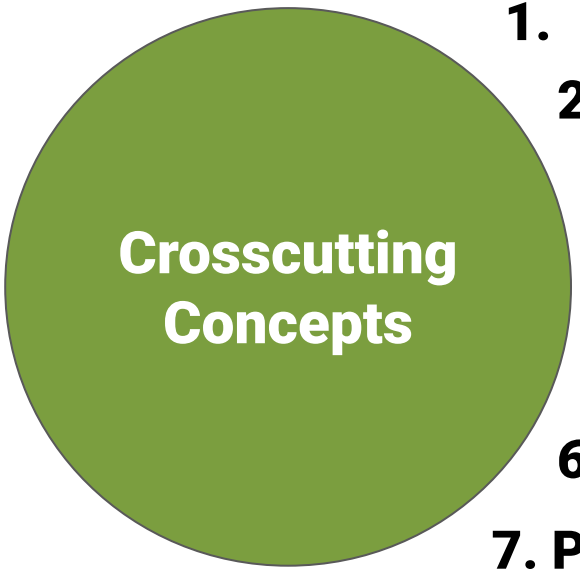
math

4. Analyzing and interpreting data
5. Using mathematics and computational thinking

language

6. Constructing explanations (for science) and designing solutions (for engineering) ✔
7. Engaging in argument from evidence ✔
8. Obtaining, evaluating, and communicating information ✔

Crosscutting Concepts: Energy Conversions



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

Energy Conversions: 3D Statements

3-D Statements

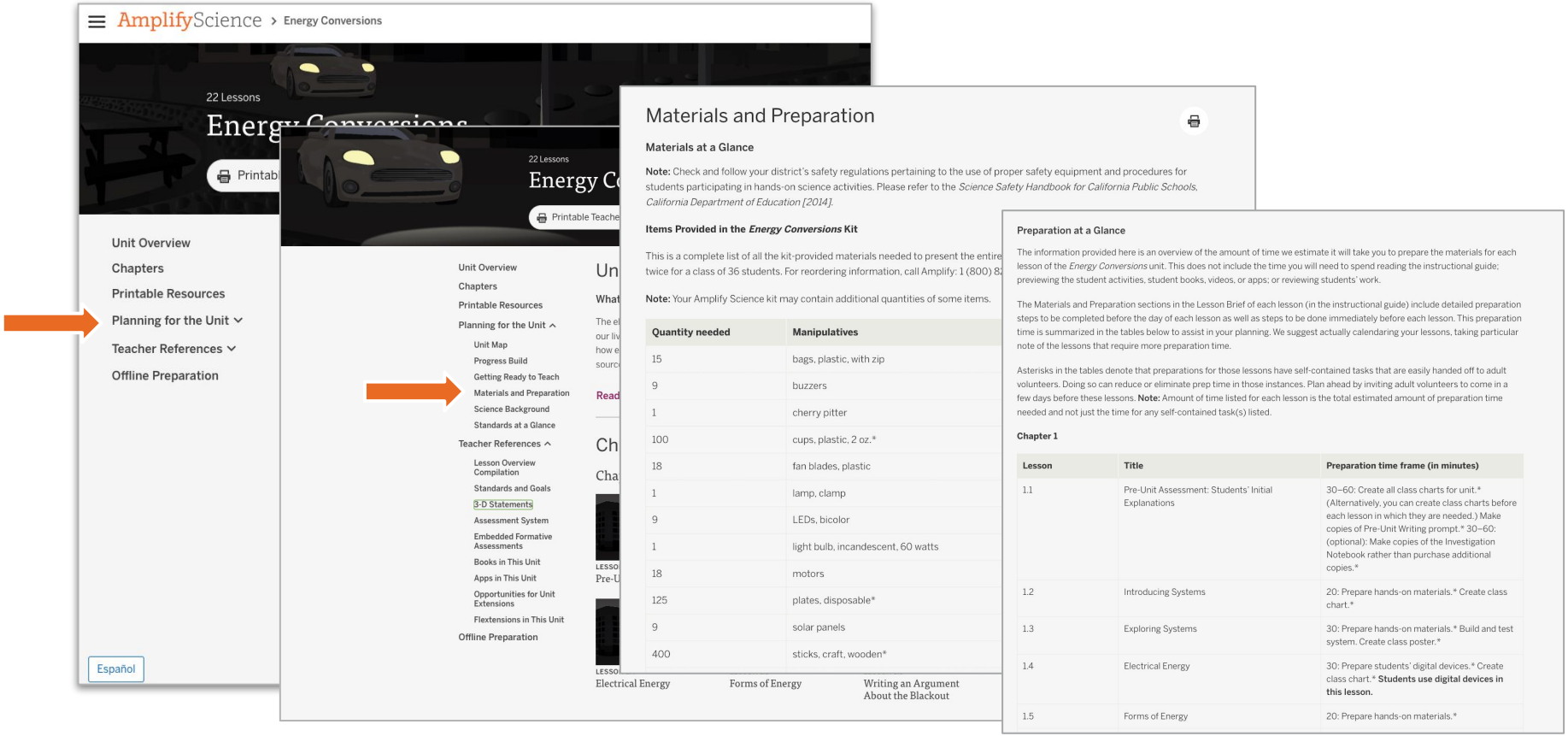
Key

Practices Disciplinary Core Ideas Crosscutting Concepts

Unit Level

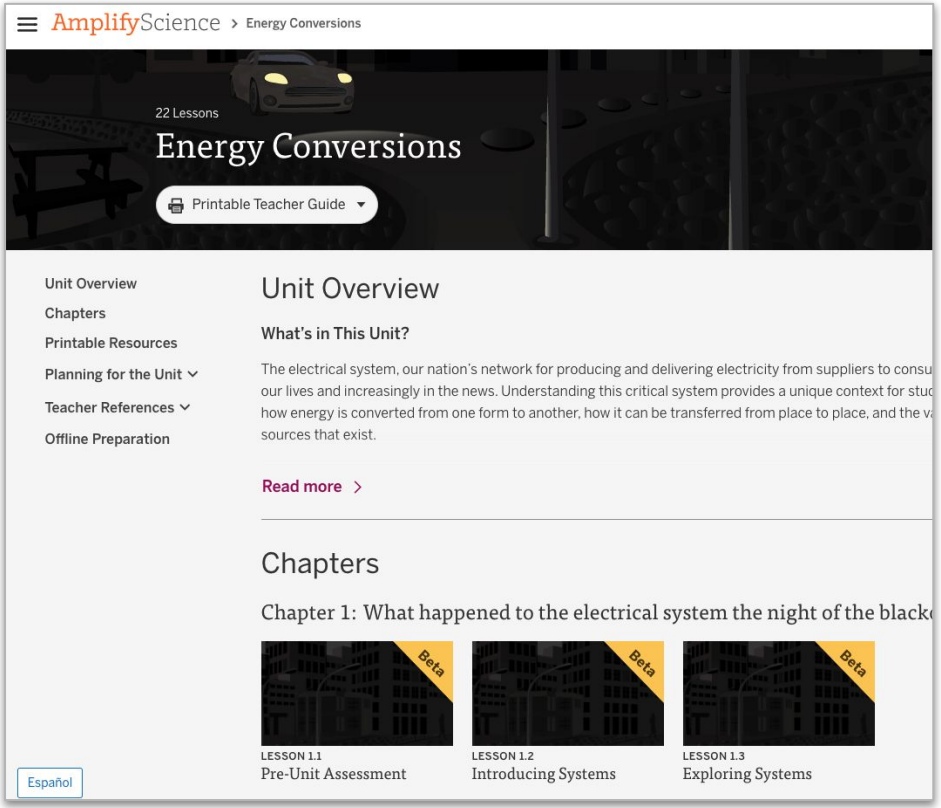
Students investigate—through firsthand experiences, a digital model, and by obtaining information by reading—how electrical systems convert and transfer energy (systems and system models, energy and matter). They use what they learn to design, test, and evaluate improvements to cause the electrical system to be more reliable, even during natural hazards and to make arguments based on evidence for the best improvements (cause and effect).

Navigating to Materials and Preparation

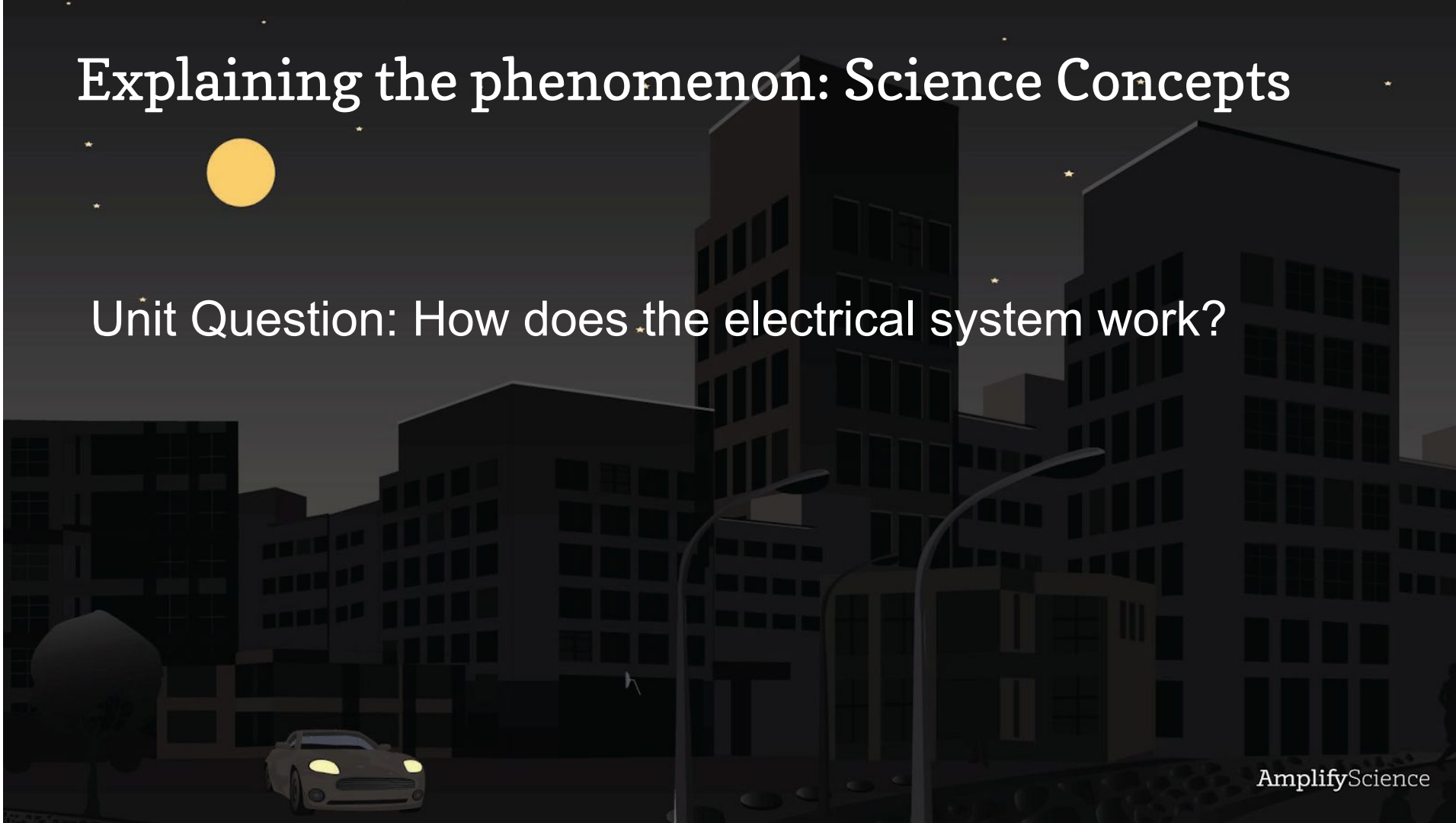


Explore or review the key planning documents

Spend a few more minutes exploring or reviewing the documents on the Unit Landing Page.



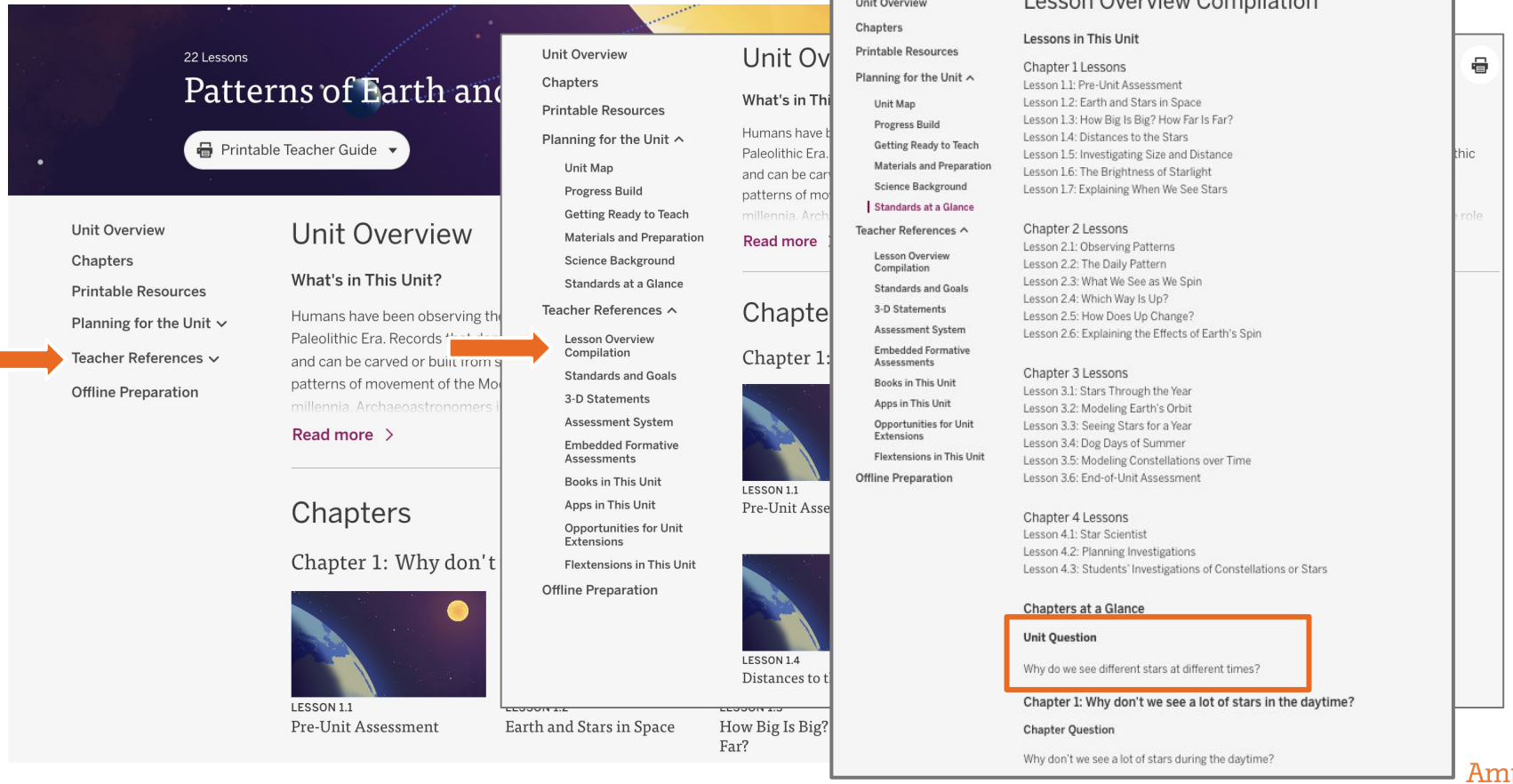
Explaining the phenomenon: Science Concepts



Unit Question: How does the electrical system work?

AmplifyScience

Navigating to the Lesson Overview Compilation

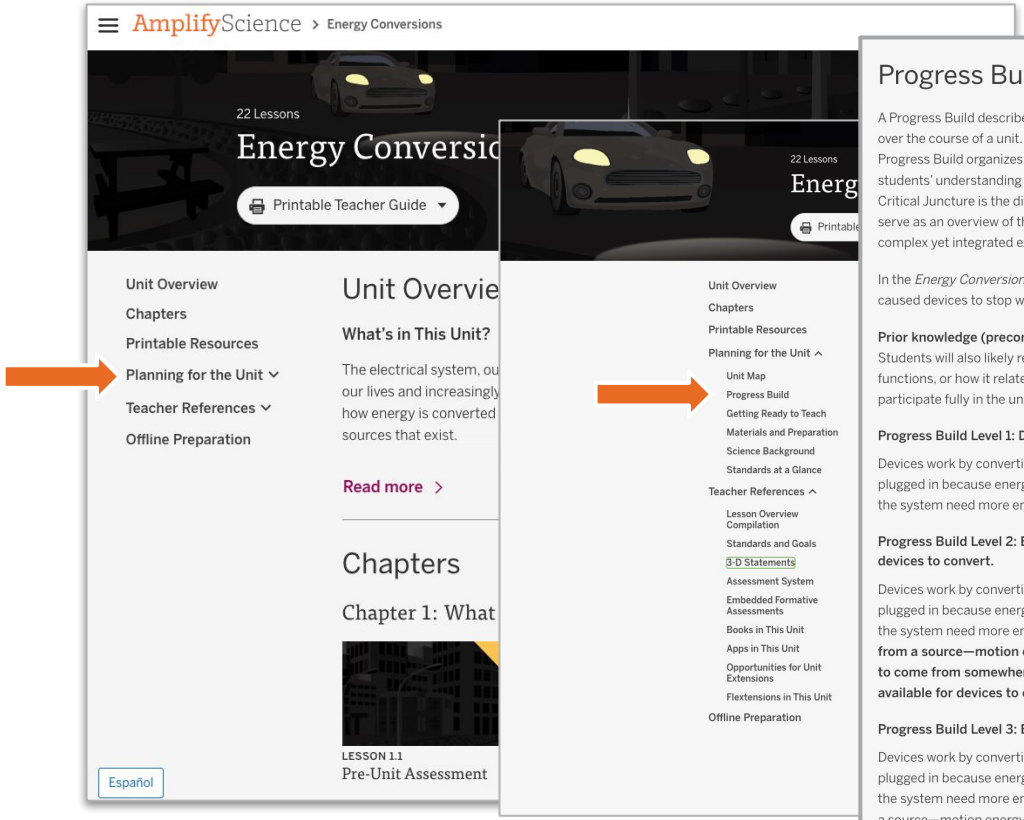


Explaining the phenomenon: Science Concepts

Unit Question: How does the electrical system work?

What **science concepts** do you think students need to understand in order to **explain the phenomenon?**

Navigating to the Progress Build



Progress Build

A Progress Build describes the way in which students' explanations of the central phenomena should develop and deepen over the course of a unit. It is an important tool in understanding the design of the unit and in supporting students' learning. A Progress Build organizes the sequence of instruction, defines the focus of the assessments, and grounds inferences about students' understanding of the content, specifically at each of the Critical Juncture Assessments found throughout the unit. A Critical Juncture is the differentiated instruction designed to address specific gaps in students' understanding. This document will serve as an overview of the *Energy Conversions: Blackout in Ergstown* Progress Build. Since the Progress Build is an increasingly complex yet integrated explanation, we represent it below by including the new ideas for each level in bold.

In the *Energy Conversions* unit, students will learn to construct scientific explanations of what could have caused a blackout and caused devices to stop working.

Prior knowledge (preconceptions): Students are likely to recognize that many familiar devices need electricity to function. Students will also likely recognize the idea that there is a source of electricity for those devices, but what that source is, how it functions, or how it relates to the device will likely still be mysterious. While neither of these ideas are necessary for students to participate fully in the unit, having exposure to these ideas will prepare students well for what they will be learning.

Progress Build Level 1: Devices work by converting electrical energy to another form.

Devices work by converting electrical energy to another form (motion, light, thermal, sound). They only work when they are plugged in because energy must be supplied to be converted. The electrical system gets a certain amount of energy. If devices in the system need more energy than is going into the system, then the devices will not function.

Progress Build Level 2: Energy must be supplied from a source and converted or there is no electrical energy available for devices to convert.

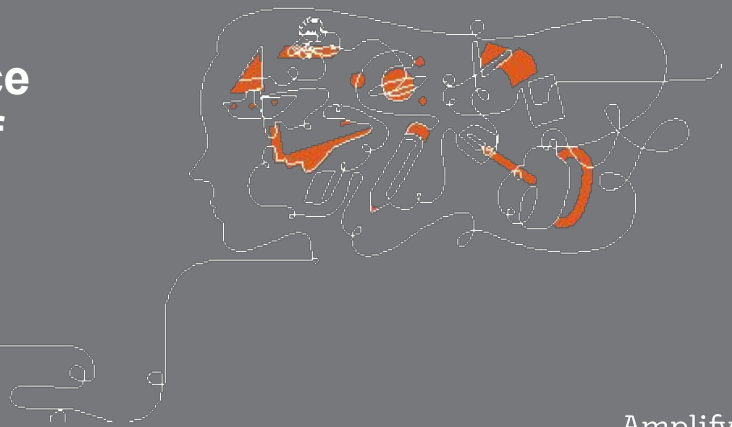
Devices work by converting electrical energy to another form (motion, light, thermal, sound). They only work when they are plugged in because energy must be supplied to be converted. The electrical system gets a certain amount of energy. If devices in the system need more energy than is going into the system, then the devices will not function. **Electrical energy is converted from a source—motion energy (wind, water, steam) is converted by a generator and light energy by solar panels. Energy has to come from somewhere, so energy must be supplied from a source and converted or there is no electrical energy available for devices to convert (the system does not function).**

Progress Build Level 3: Electrical energy can be transferred by wires connecting the source converter to the device.

Devices work by converting electrical energy to another form (motion, light, thermal, sound). They only work when they are plugged in because energy must be supplied to be converted. The electrical system gets a certain amount of energy. If devices in the system need more energy than is going into the system, then the devices will not function. Electrical energy is converted from a source—motion energy (wind, water, steam) is converted by a generator and light energy by solar panels. Energy has to come

Progress Build

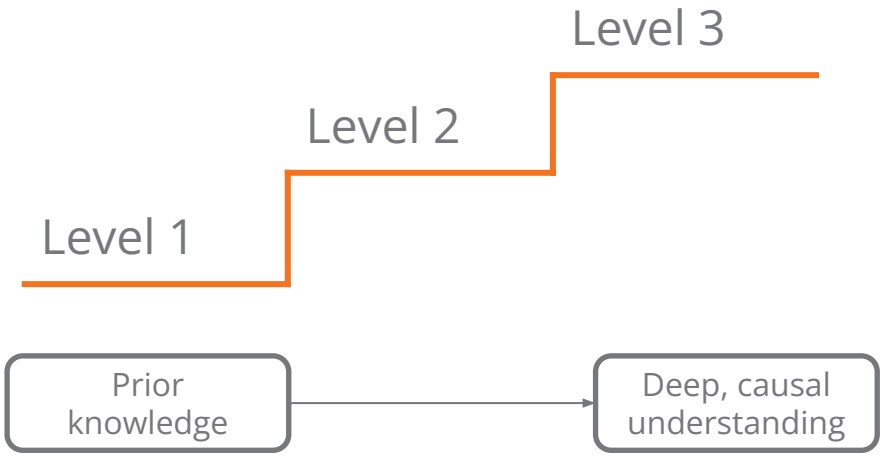
A Progress Build describes the way in which students' explanations of the central phenomenon should develop and deepen over the course of a unit. It is an important tool in understanding the design of the unit and in supporting students' learning. **A Progress Build organizes the sequence of instruction and defines the focus of the assessments.**



Unpacking the Progress Build

Understanding a unit's Progress Build will help you guide your students, address misconceptions, and avoid giving ideas away too early in the unit.

In this activity, you'll use the Progress Build.



Progress Build

Energy Conversions

Assumed prior knowledge (preconceptions): Students are likely to recognize that many familiar devices need electricity to function.

Level 1

Devices work by converting electrical energy to another form.

Level 2

Energy must be supplied from a source and converted or there is no electrical energy available for devices to convert.

Level 3

Electrical energy can be transferred by wires connecting the source converter to the device.

Unpacking the Progress Build

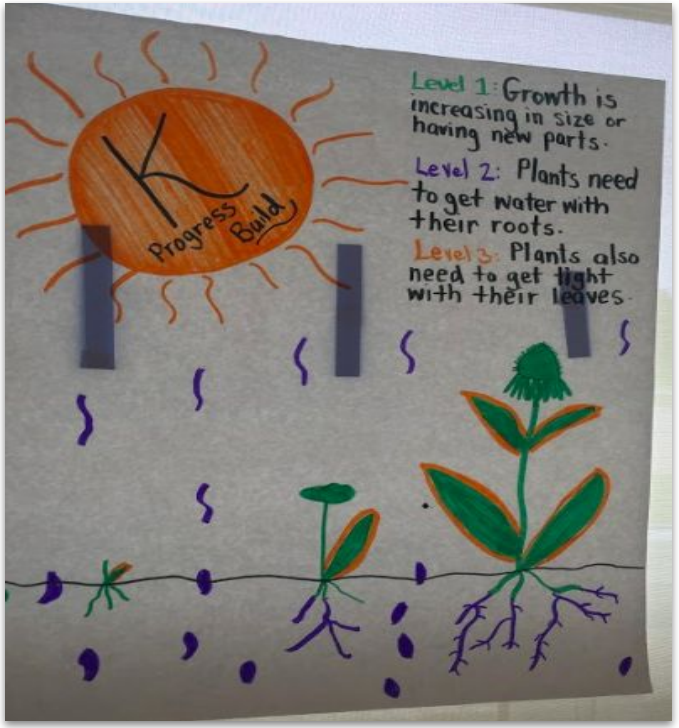
Group Work time

The purpose of this next work time is to understand what the levels of the Progress Build are in this unit, and reinforce understanding of its science concepts.

Progress Build analysis

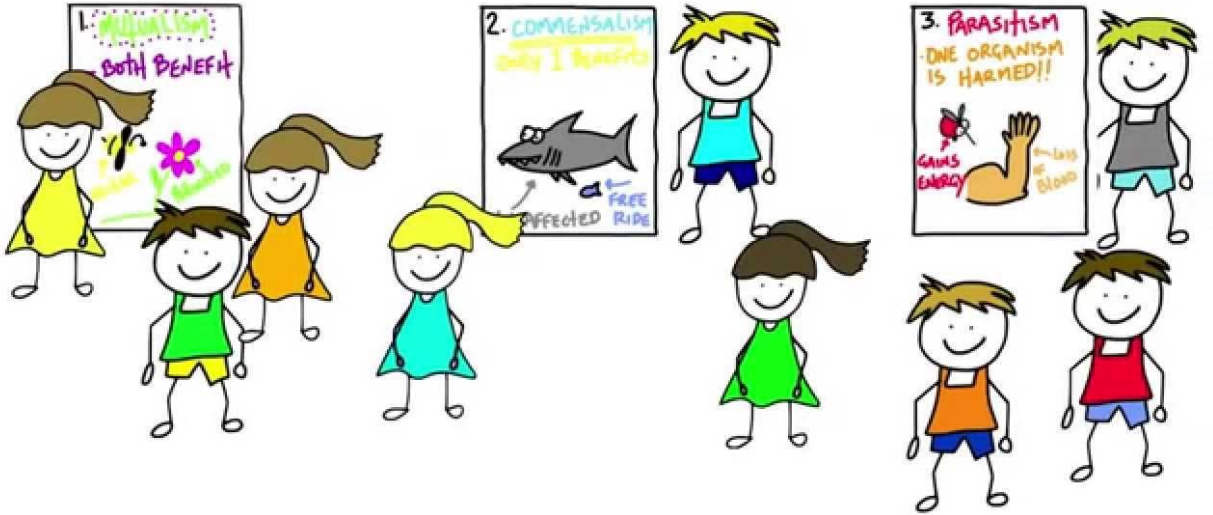
Group work time

- With your group or partner, create a visual representation of all the levels of your unit's progress build.

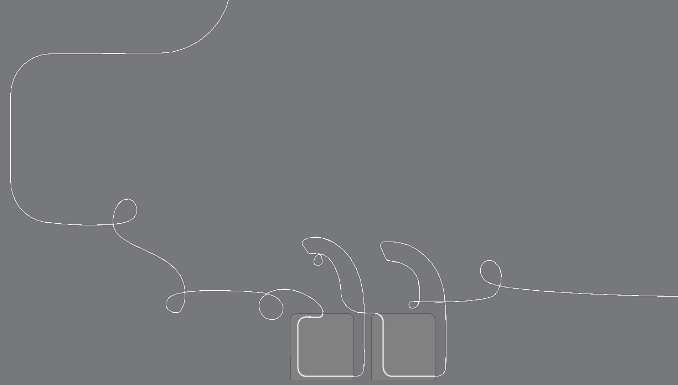


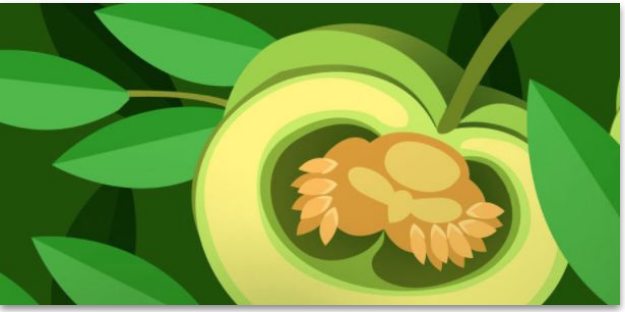
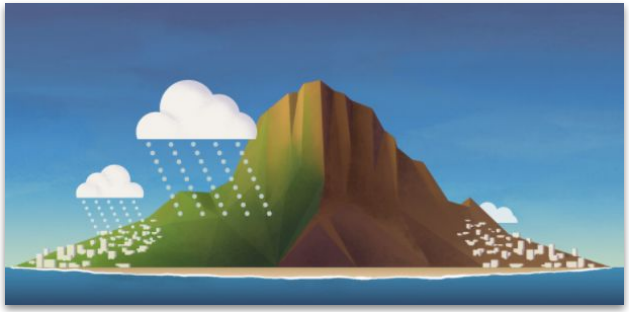
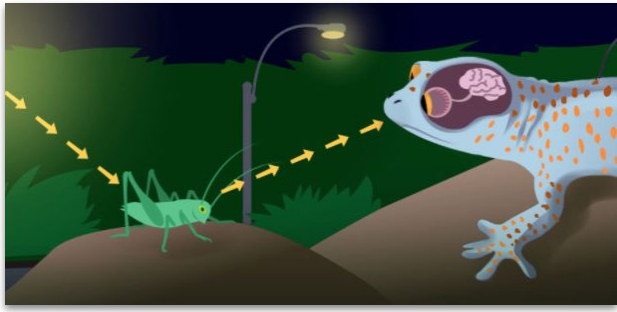
Progress Build analysis

Presentations



Questions?



Plan for the day

- Introduction and framing
- Unit Internalization
- Digging into Chapter 1
- Model Lesson
- Digging into Chapter 2
- Planning
- Closing

Energy Conversions: Chapter 1

Chapters

Chapter 1: What happened to the electrical system the night of the blackout?

LESSON 1.1
Pre-Unit Assessment

LESSON 1.2
Introducing Systems

LESSON 1.3
Exploring Systems

LESSON 1.4
Electrical Energy

LESSON 1.5
Forms of Energy

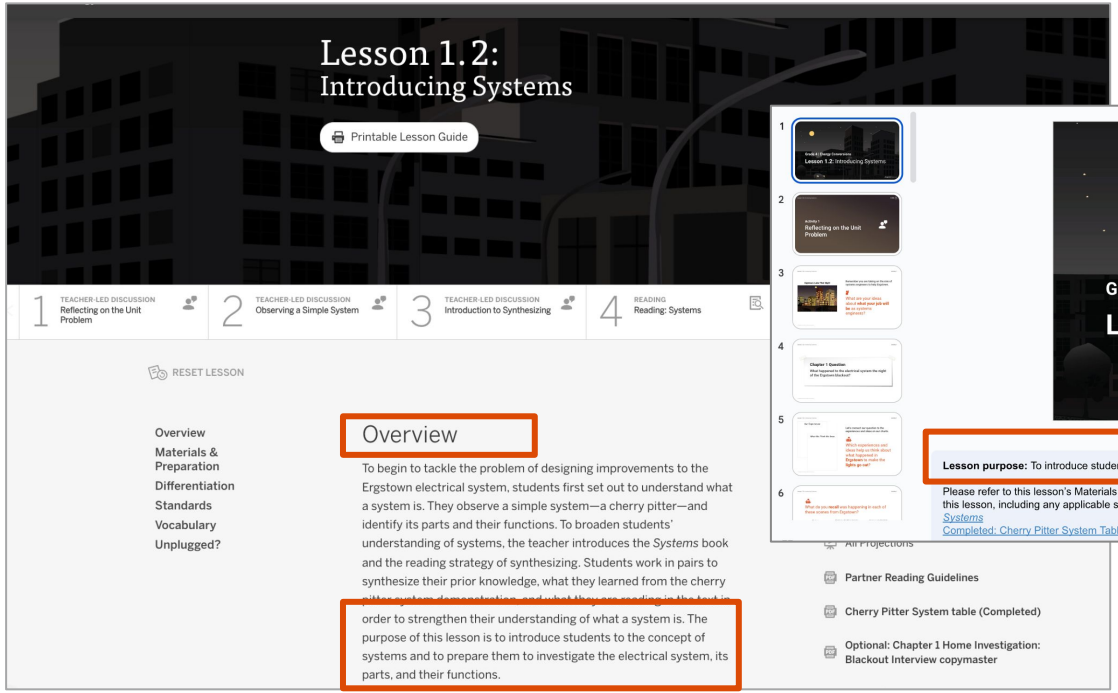
LESSON 1.6
Writing an Argument About the Blackout

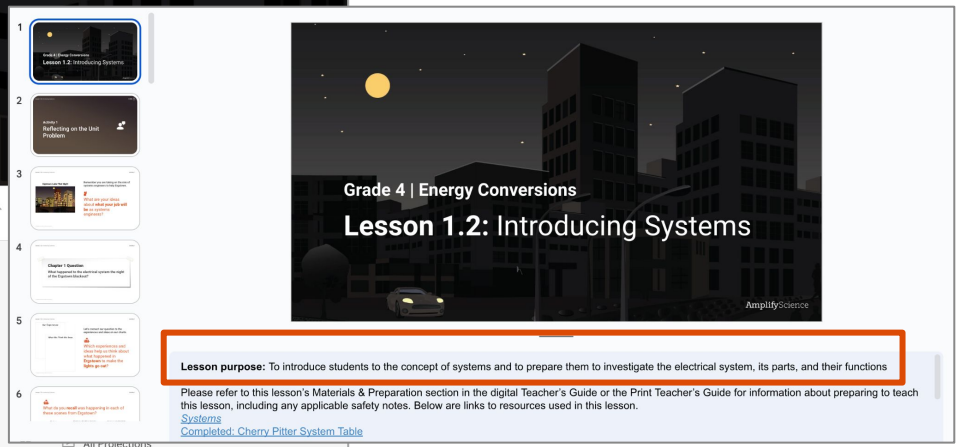
Digging in to Chapter 1

Group Work time

1. Form groups or pairs.
2. Each group will pick a lesson in Chapter 1 (1.1 - 1.4)
3. Chart the activities in the lesson. Be sure to include:
    a. Purpose of lesson
    b. Modalities of each activity
    c. Vocabulary introduced
    d. Key Concepts introduced

Purpose of the lesson





Classroom Slides

Lesson Brief

Amplify.

Modalities

Lesson at a Glance

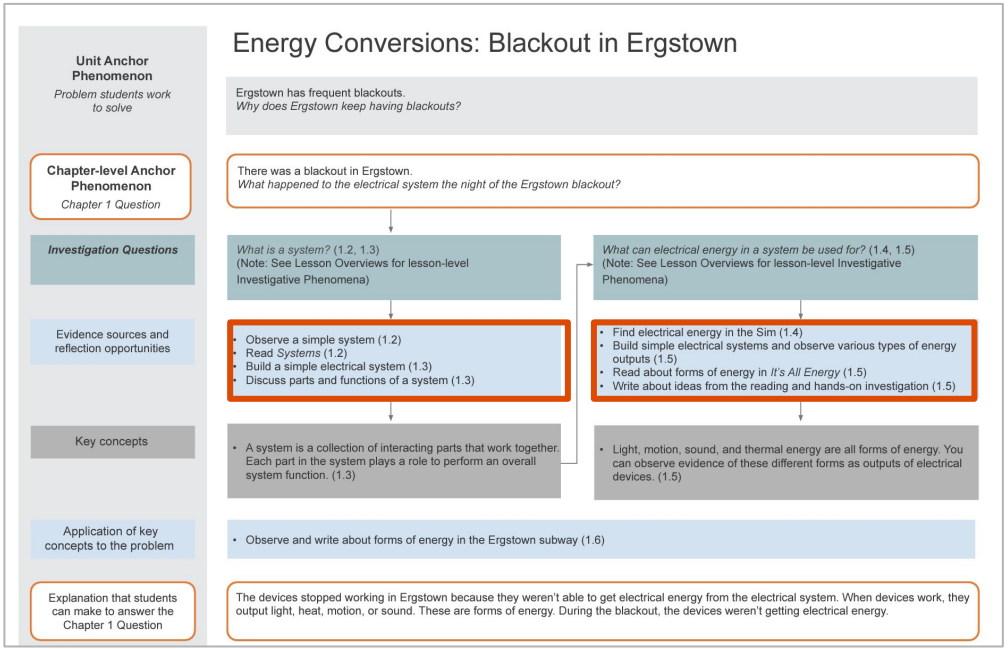
1: Reflecting on the Unit Problem (5 min.)
To prepare to begin their investigations, students reflect on the unit problem and their role as systems engineers.

2: Observing a Simple System (15 min.)
As a first step toward building an understanding of how electrical systems work, students are introduced to an example of a simple system—a cherry pitter. Students observe the cherry pitter system to identify the parts of the system and their functions.

3: Introduction to Synthesizing (15 min.)
The teacher introduces *Systems*, then introduces and models the reading strategy of synthesizing in order to prepare students to synthesize as they read the book with a partner.

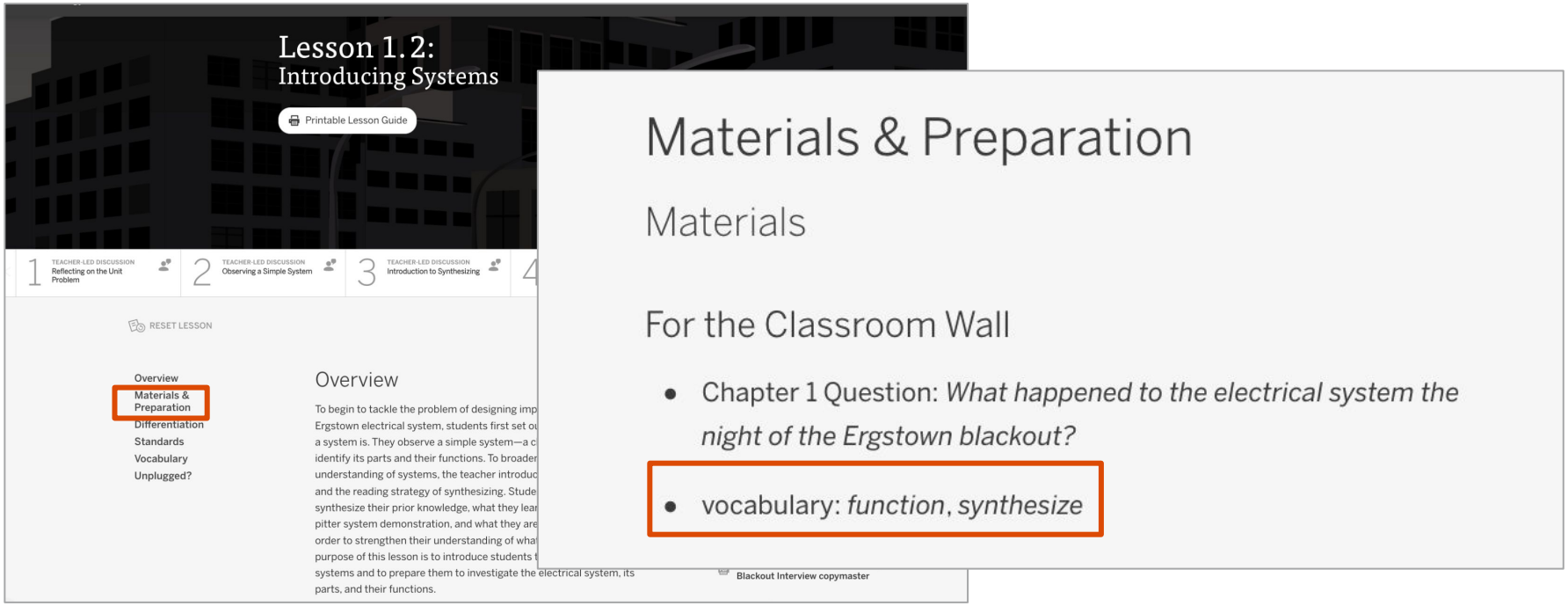
4: Reading: Systems (25 min.)
Partners read *Systems* and apply the synthesizing strategy to generate new ideas to help them answer the first Investigation Question: *What is a system?* Post-reading discussion provides students with an opportunity to hear the new ideas about systems that their classmates have generated. This activity also provides an On-the-Fly Assessment of students' developing ability to synthesize information as a reading strategy.

The Lesson Brief: Lesson at a Glance



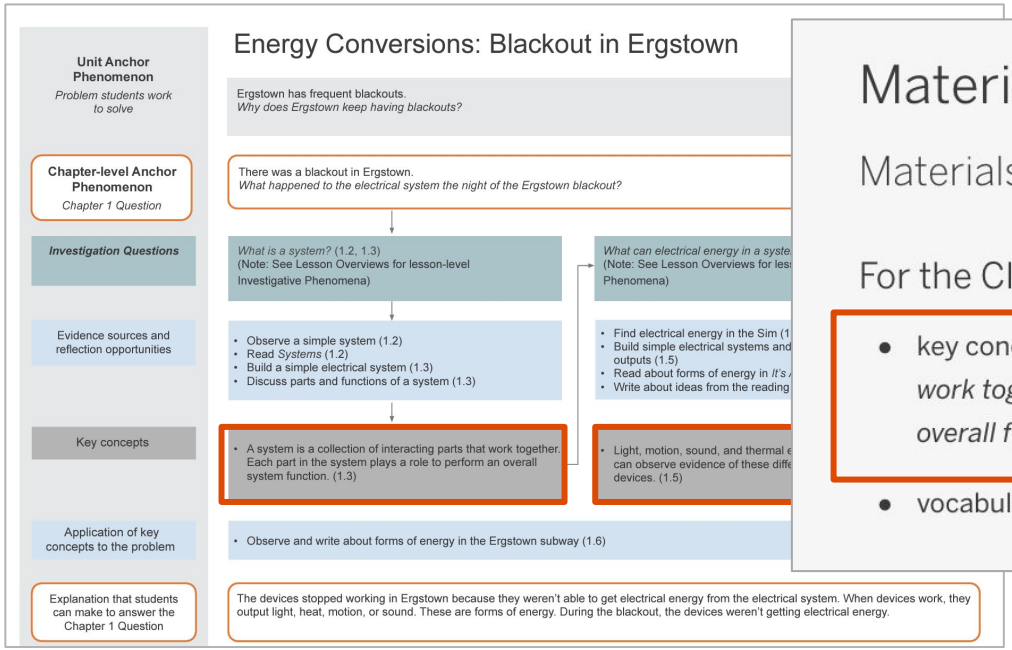
Coherence Flowchart

Vocabulary

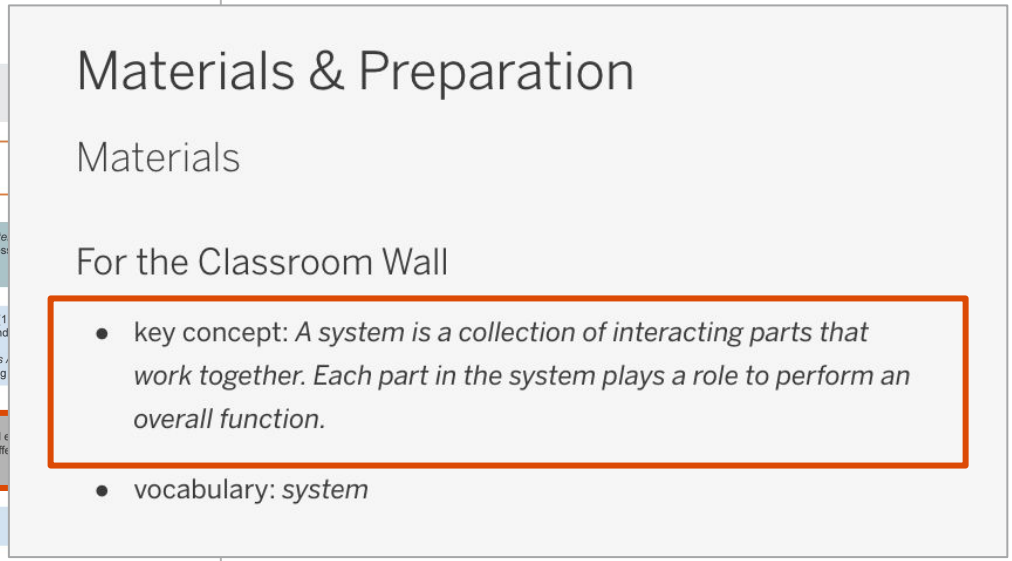


Lesson Brief:

Key Concepts



Coherence Flowchart



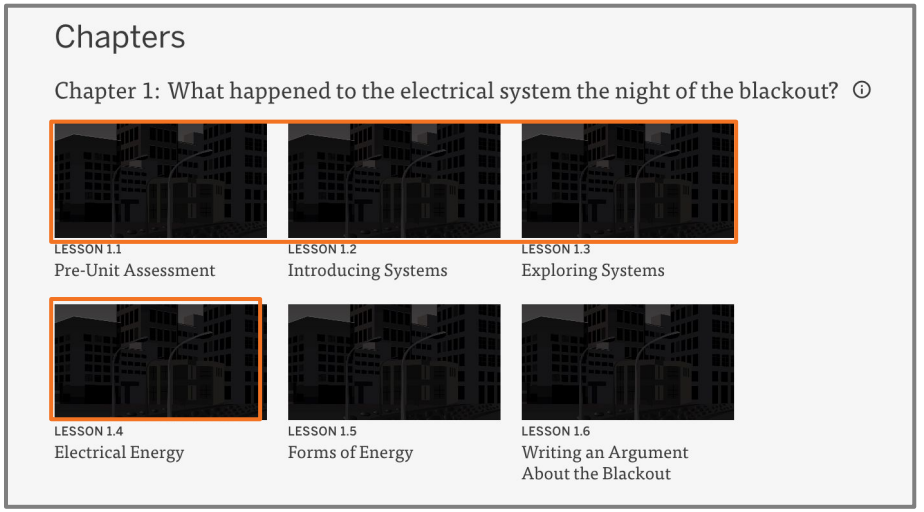
Materials and Preparation

Digging in to chapter 1

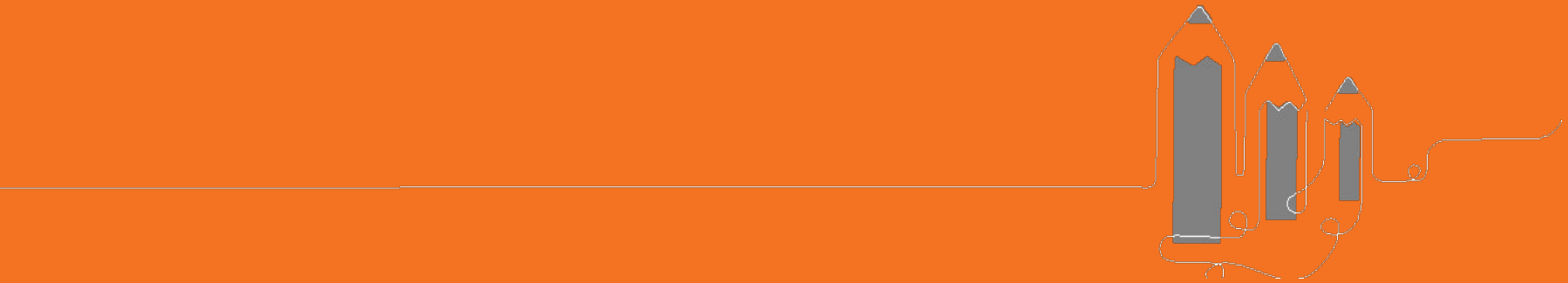
Group Work time

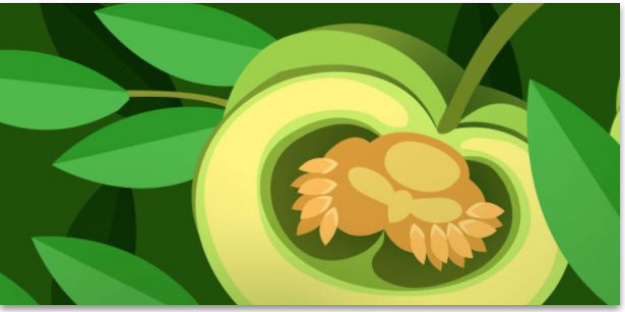
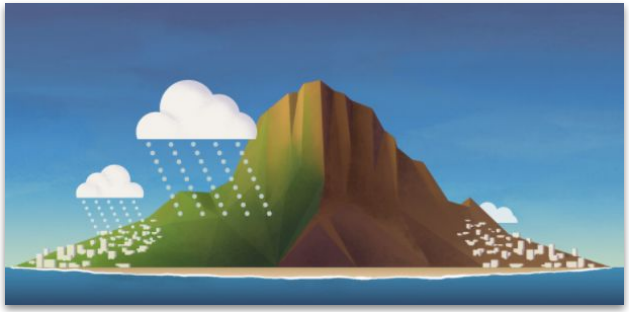
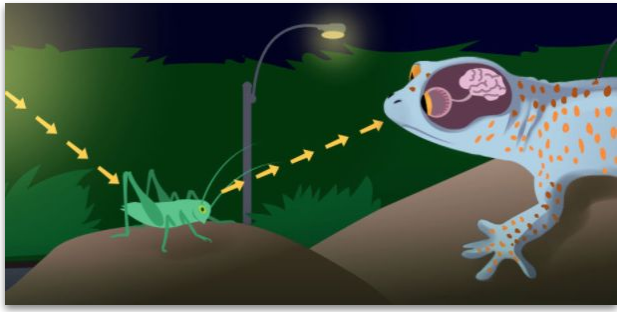
1. Form groups of 2, 3, or 4
2. Each group will pick a lesson in Chapter 1 (1.1 - 1.7)
3. Chart the activities in the lesson. Be sure to include:
    a. Purpose of lesson
    b. Modalities of each activity
    c. Vocabulary introduced
    d. Key Concepts introduced

Presentations



Break



Plan for the day

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- Closing

Energy Conversions: Chapter 1

Chapters

Chapter 1: What happened to the electrical system the night of the blackout?

LESSON 1.1
Pre-Unit Assessment

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Introducing Systems

LESSON 1.3
Exploring Systems

LESSON 1.4
Electrical Energy

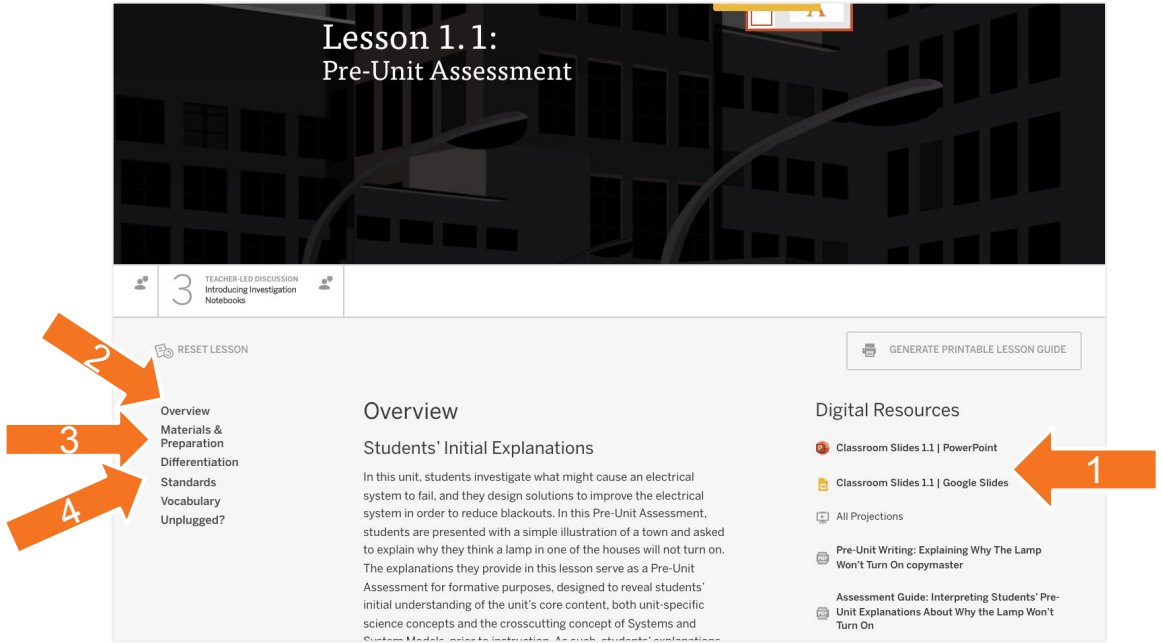
LESSON 1.5
Forms of Energy

LESSON 1.6
Writing an Argument About the Blackout

4 Easy Steps to teaching a lesson

DIRECTIONS:

1. Download the **Classroom Slides** for **Lesson 1.1** and review them.
2. Read the **Overview**.
3. Explore the **Materials & Preparation** document.
4. Read the **Differentiation** document.



Unit: Energy Conversions Lesson: 1.5

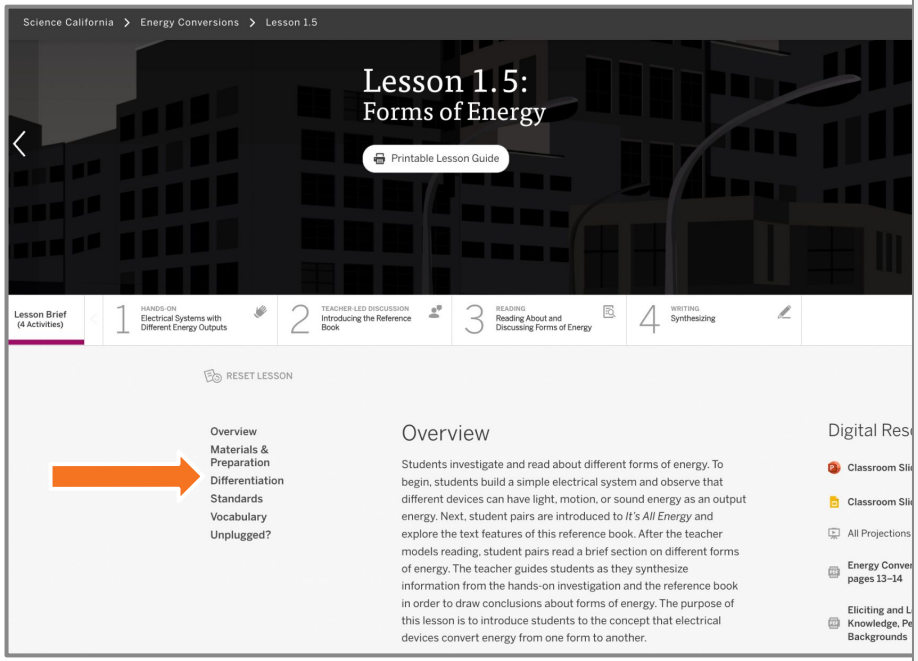
Purpose: To introduce students to the concept that electrical devices convert energy from one form to another.

Materials and Preparation: Immediately Before the Lesson

On the board, write the Investigation Question if it was erased. Write: “What can electrical energy in a system be used for?”
Have on hand the following materials:

i. materials for the classroom wall
ii. bags of materials for simple electrical system activity
iii. copies of *It’s All Energy*
iv. masking tape
v. marker
vi. *Energy Conversions* Investigation Notebook (pages 13–14)

Lesson 1.5 Differentiation



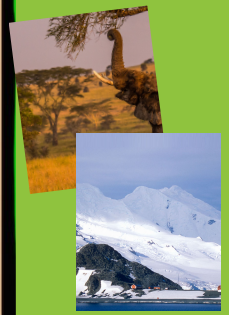
Specific Differentiation Strategies for English Learners

Designated English Language Development (ELD). Since this lesson calls for introducing new academic language, during Designated ELD, you can teach some important terms explicitly. See an example of a 7-step General Academic Vocabulary Instruction lesson plan, found in the CA ELA-ELD Framework, which provides details on how to implement such an approach.

Additional visual representations. English learners can often more easily access and recall science content through visual representations. You might consider providing additional visuals to illustrate the new terms *thermal energy*, *sound energy*, *motion energy*, and *light energy* introduced in this lesson. You can make simple labeled drawings on the board as you introduce the terms. You can also invite students to make drawings to illustrate the terms, and you can post these on the wall.

Strategic partnering. This lesson includes extended partner work as students build electrical systems with different outputs. Extended academic discourse that is equitable (that is, all students have an opportunity to engage) is critical for developing both language and content knowledge. Strategic partnering is essential for as students they develop their understanding of new content and core vocabulary. Therefore, consider carefully which partner to assign for each English learner in your class and assign a partner who has slightly higher English language skills than the student in question. Opportunities for English learners to engage in conversations that are slightly above their language-proficiency levels can accelerate second-language learning and increase students' confidence when engaging in science discourse. Try to assign each English Learner a partner who be likely to engage in an extended discussion and who will support their partner to participate equitably. We suggest you

Energy Conversions



Unit Question: How does the electrical system work?

Chapter 1 Question: What happened to the electrical system the night of the blackout?

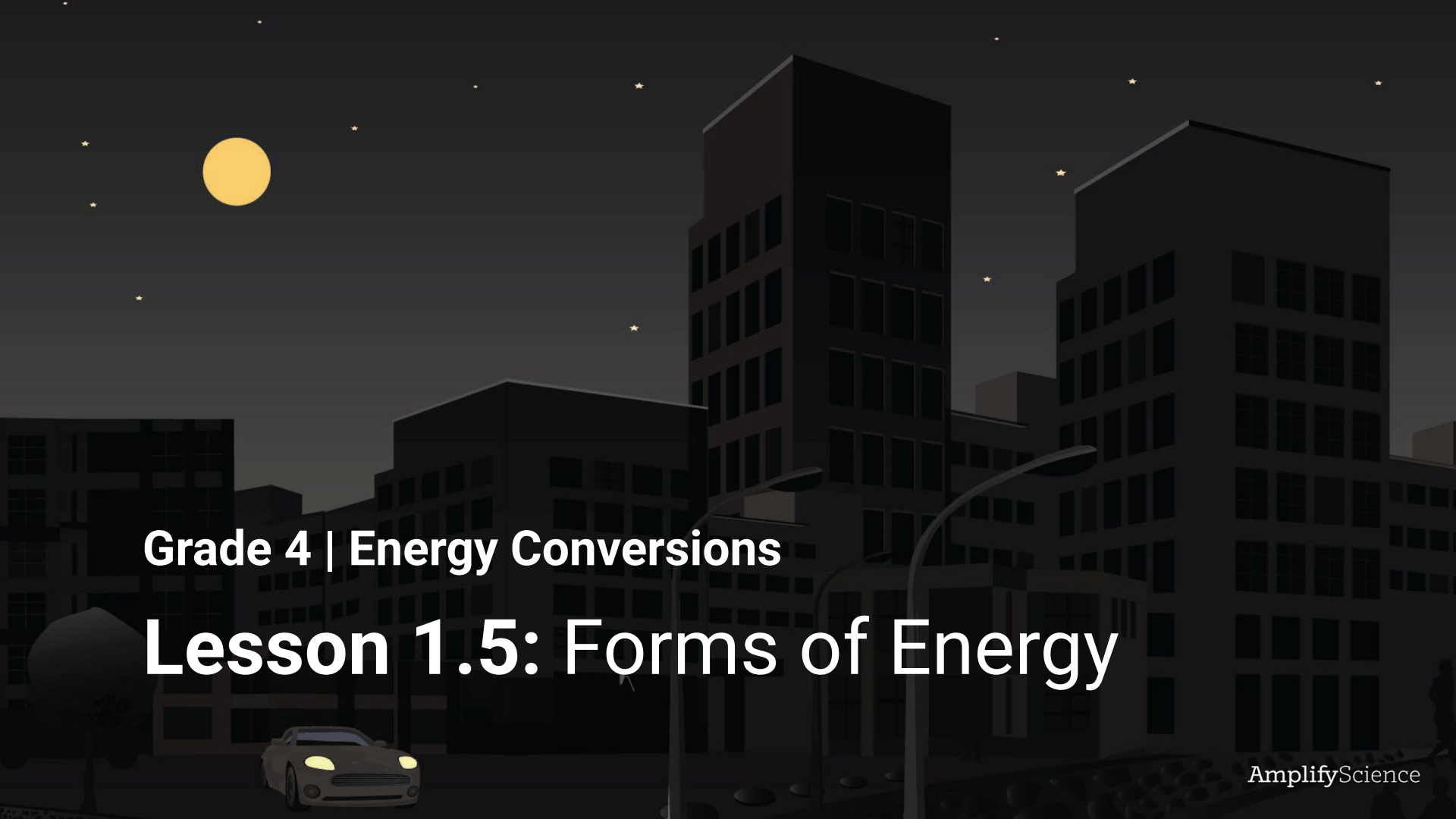
Investigation Question: What is a system? What can electrical energy in a system be used for?

Key Concepts

#1. A system is a collection of interacting parts that work together. Each part in the system plays a role to perform an overall system function.

Vocabulary

- engineer
- function
- synthesize
- system
- electrical device



Grade 4 | Energy Conversions

Lesson 1.5: Forms of Energy

AmplifyScience

20 MIN

Activity 1

Electrical Systems with Different Energy Outputs

Remember that we are investigating this question:

What can electrical energy in a system be used for?

Electrical System

Part: ?	**Part:** power plant	**Part:** wires	**Part:** electrical devices
Function:	**Function:**	**Function:**	**Function:**

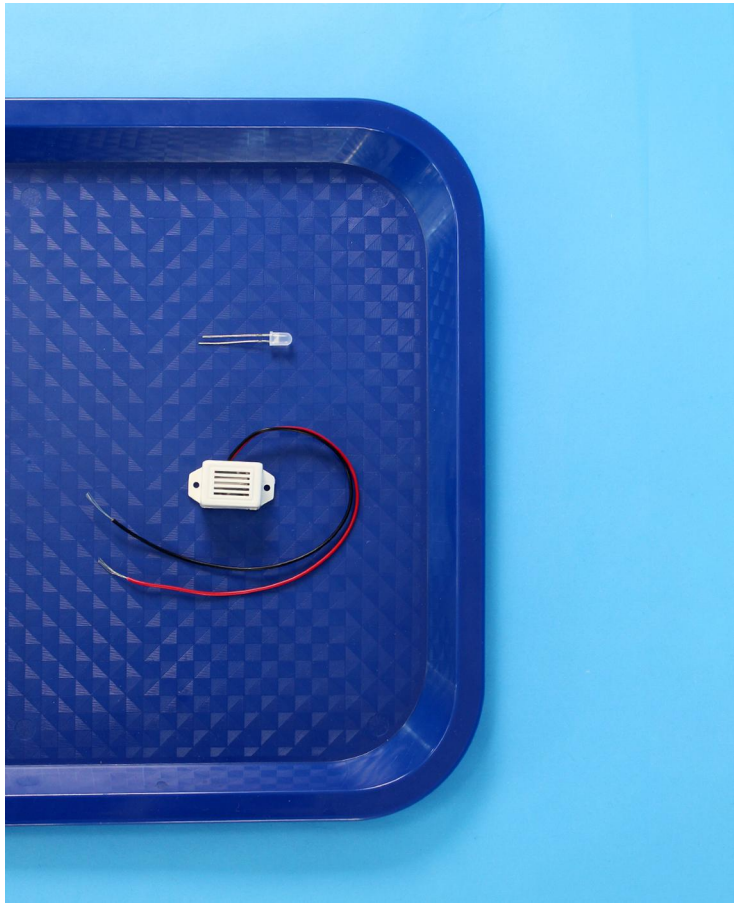
Electrical Safety Guidelines

- Only attach the clips to the electrical devices that are part of the lesson.
- Keep the moving fan away from your face.
- Keep all electrical investigation materials away from electrical outlets.
- Keep all electrical investigation materials away from water.

Scientists and engineers are careful to do their investigations in a safe way.

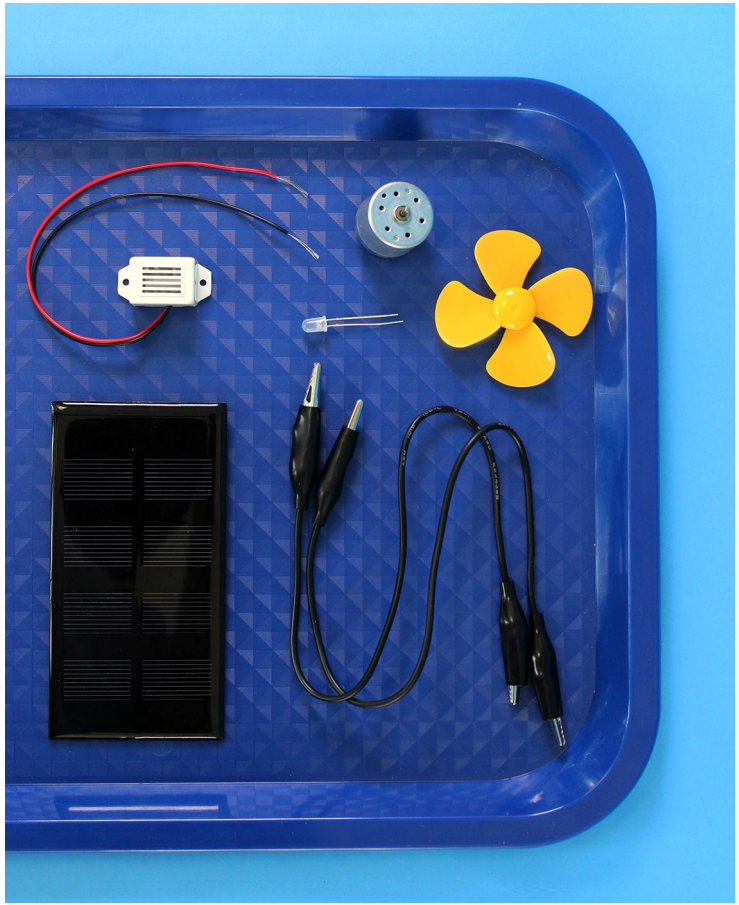
These are the parts you used to build a simple electrical system before.

What's one way to put the parts together to **build a functioning system**?



You will be working with two new parts.

Your challenge today is to build systems using these **new parts.**

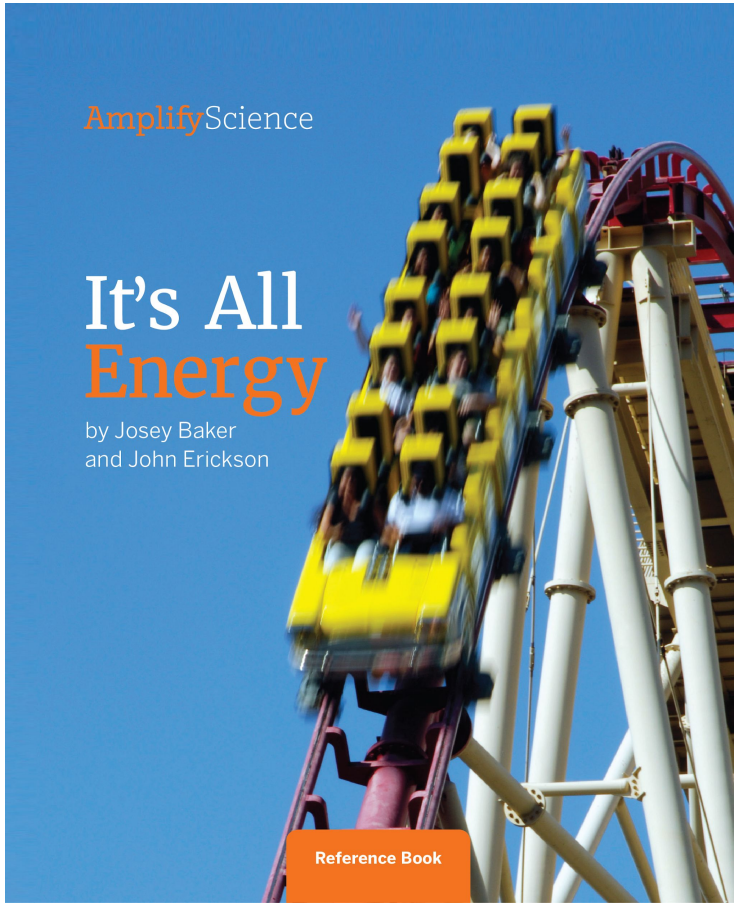


What happened once the systems were functioning?

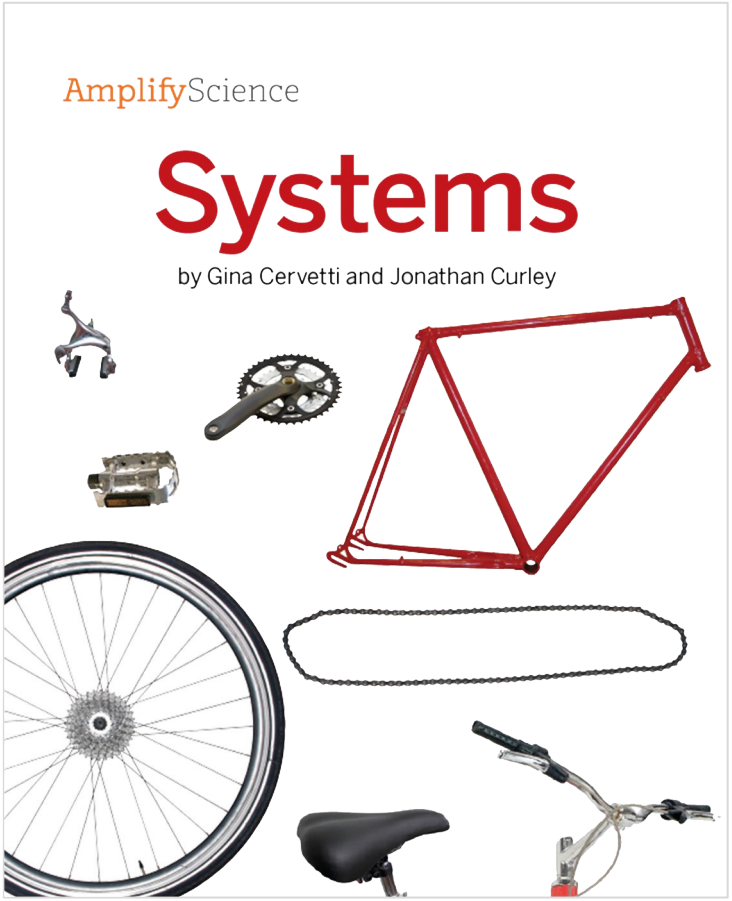
10 MIN

Activity 2

Introducing the Reference Book

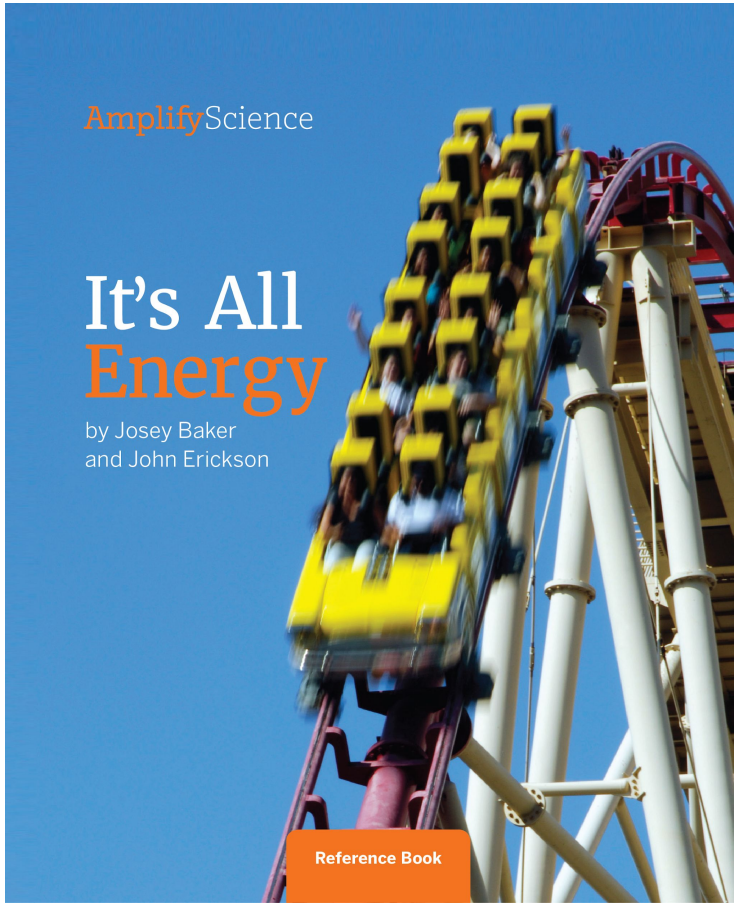


We're going to use this **reference book** to find out more about our Investigation Question: *What can electrical energy in a system be used for?*



Reference books have text features that are similar to the ones in *Systems*.

What **text features** do you remember from that book?



Flip through the book and look for all the different text features you can find.

What text features did you notice? How do you think those features might help you as you are reading?

15 MIN

Activity 3

Reading About and Discussing Forms of Energy

One important text feature is the table of contents.

Who can remind us what the purpose of the table of contents is?

Contents

What Is Energy? 4
Forms of Energy 6
- Electrical Energy 8
- Motion Energy 9
- Sound Energy 10
- Thermal Energy 11
- Light Energy 12
- Chemical Energy 13

Energy Converters 14
- Electrical Devices 14
- Source Converters 17
- Other Energy Converters 23

Energy Sources 26
- Fossil Fuels 28
- Wind 30
- Sun 32
- Water 34
- Nuclear Fuel 36
- Geothermal 38
- Biofuels 40

Transferring Energy 42
- Fuel Trucks 42
- Electrical Wires 43
- Gas Pipelines 43
- Hot Air, Hot Water, and Steam 44
- Food 44
- Sunlight 45
- Collisions 45

Glossary 46
Index 47

Turn to page 3.

Which section will help you find out more about what energy is?

What Is Energy?

Energy makes things happen. Every time something starts moving, it is because of energy. Every time something makes a noise, it is because of energy. Every time something gets warmer, it is because of energy. People use energy when we talk, run, and think. In fact, every time we do anything, we use energy!

All of the things happening in these pictures are happening because of energy.

Based on what we've read so far, what can we say about what **energy** is?

Vocabulary

energy

the ability to make things move or change

Contents

What Is Energy? 4
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- Geothermal 38
- Biofuels 40

Transferring Energy 42
- Fuel Trucks 42
- Electrical Wires 43
- Gas Pipelines 43
- Hot Air, Hot Water, and Steam 44
- Food 44
- Sunlight 45
- Collisions 45

Glossary 46
Index 47

We want to know about **electrical energy**. The table of contents shows that the Electrical Energy page is part of a section called “Forms of Energy.” It starts on page 6.

Forms of Energy

The examples on these pages might look like a lot of different things, but they are really all showing just one thing—**energy**. All of these **forms** of energy can make things move or change. They all can be **converted** from the form they are in to any of the other forms. They are all energy.

Electrical energy powers this hair dryer. Anything that you can plug in uses electrical energy.

Motion is a form of energy. An airplane in the sky has **motion energy.** So does anything else that is moving.

Read about the different forms of energy on pages 6–7.

Forms of Energy

The examples on these pages might look like a lot of different things, but they are really all showing just one thing—**energy**. All of these **forms** of energy can make things move or change. They all can be **converted** from the form they are in to any of the other forms. They are all energy.

Electrical energy powers this hair dryer. Anything that you can plug in uses electrical energy.

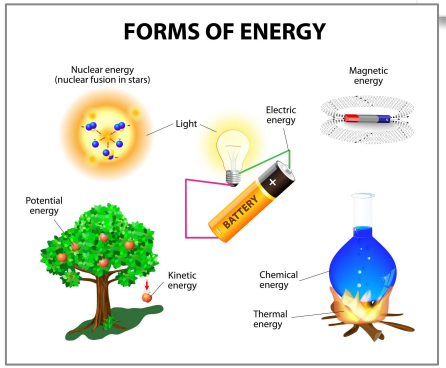
Motion is a form of energy. An airplane in the sky has **motion energy.** So does anything else that is moving.

What does the book mean by “forms of energy”?

Vocabulary

form (of energy)

type or kind (of energy)



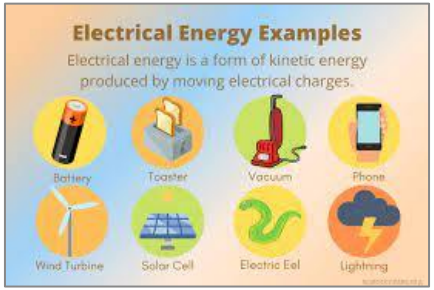
Motion energy, sound energy, light energy, and thermal energy are all forms of energy.

Electrical energy is another form of energy.

Vocabulary

electrical energy

the form of energy that is transferred through wires



15 MIN

Activity 4

Synthesizing

Name: _____ Date: _____

Synthesizing Ideas About Forms of Energy

1. Think about what you have learned about energy forms from the reference book and your experiences building simple electrical systems.
2. Record your ideas in the first two boxes.
3. Then, put the ideas together. Write a new understanding in box below the arrow.

Idea:

Source: *It's All Energy*

+

Idea:

Source: Building simple electrical systems

↓

New understanding:

Turn to page 14 of your notebooks.

Let's think about how we can use this graphic organizer to help us **synthesize** our ideas.

Name: _____ Date: _____

Synthesizing Ideas About Forms of Energy

1. Think about what you have learned about energy forms from the reference book and your experiences building simple electrical systems.
2. Record your ideas in the first two boxes.
3. Then, put the ideas together. Write a new understanding in box below the arrow.

Idea:
anything you can plug in uses electrical energy

Source: *It's All Energy*

+

Idea:

Source: Building simple electrical systems

↓

New understanding:

We read in *It's All Energy* that anything you can plug in uses electrical energy, so we could write that in the **first box** in the notebook.

Name: _____ Date: _____

Synthesizing Ideas About Forms of Energy

1. Think about what you have learned about energy forms from the reference book and your experiences building simple electrical systems.
2. Record your ideas in the first two boxes.
3. Then, put the ideas together. Write a new understanding in box below the arrow.

Idea: anything you can plug in uses electrical energy

Source: *It's All Energy*

+

Idea:

Source: Building simple electrical systems

↓

New understanding:

The second box is for an idea from building our simple electrical systems.

What is something you learned about how these devices **use electrical energy**?

Name: _____ Date: _____

Synthesizing Ideas About Forms of Energy

1. Think about what you have learned about energy forms from the reference book and your experiences building simple electrical systems.
2. Record your ideas in the first two boxes.
3. Then, put the ideas together. Write a new understanding in box below the arrow.

Idea:

Source: *It's All Energy*

+

Idea:

Source: Building simple electrical systems

↓

New understanding:

Write an idea from the book and an idea from the electrical system you built. Then put the ideas together to create a new understanding.

Our Experiences

What We Think We Know

Let's connect what we learned to the experiences and ideas on our charts.

Does what you learned remind you of any of the **experiences** you shared? Have any of your **ideas** changed?

Name: _____ Date: _____

Synthesizing Ideas About Forms of Energy

1. Think about what you have learned about energy forms from the reference book and your experiences building simple electrical systems.
2. Record your ideas in the first two boxes.
3. Then, put the ideas together. Write a new understanding in box below the arrow.

Idea:

Source: *It's All Energy*

+

Idea:

Source: Building simple electrical systems

↓

New understanding:

Who would like to share the **new understanding** they came up with?

Key Concept

Light, motion, sound, and thermal energy are all forms of energy. You can observe evidence of these different forms as outputs of electrical devices.

End of Lesson

THE LAWRENCE HALL OF SCIENCE
UNIVERSITY OF CALIFORNIA, BERKELEY

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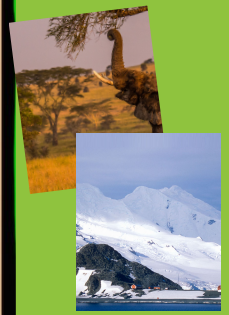
Energy Conversions



Unit Question: How does the electrical system work?

Chapter 1 Question: What happened to the electrical system the night of the blackout?

Investigation Question: What is a system? What can electrical energy in a system be used for?

Key Concepts

#1. A system is a collection of interacting parts that work together. Each part in the system plays a role to perform an overall system function.

#2 Light, motion, sound, and thermal energy are all forms of energy. You can observe evidence of these different forms as outputs of electrical devices.

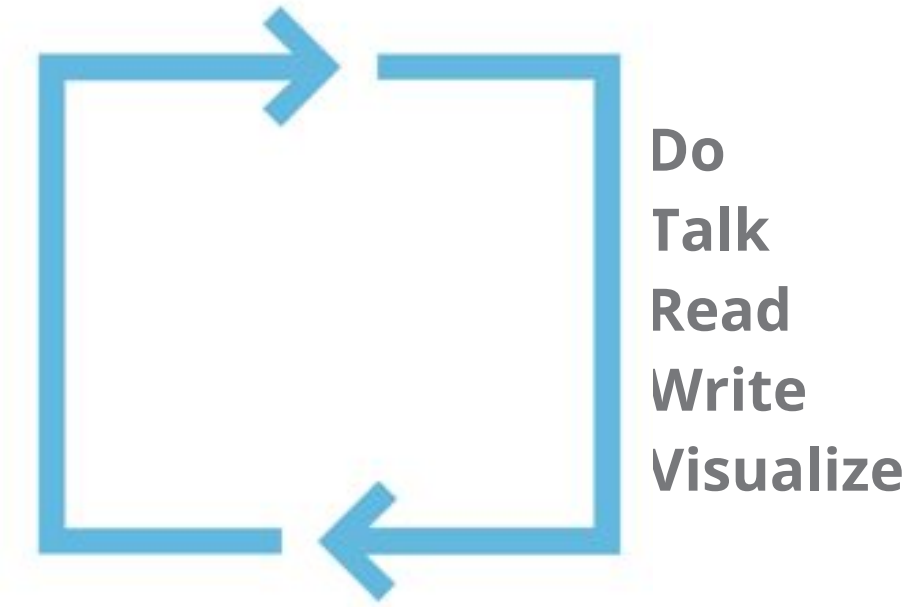
Vocabulary

- engineer
- function
- synthesize
- system
- Electrical device
- Electrical energy
- energy
- forms (of energy)

Energy Conversions

Throughout the unit, they **explore** reasons why an electrical system may fail. Through firsthand **experiences, discourse, reading, writing, and engaging with a digital simulation,** students make discoveries about the way electrical systems work. As they work to solve the problem of blackouts in Ergstown, students will **use and construct devices** that convert energy from one form to another, build an understanding of the electrical system, and learn to identify energy forms all around them.

Lesson 1.5 Multimodal learning



Energy Conversions Lesson 1.5

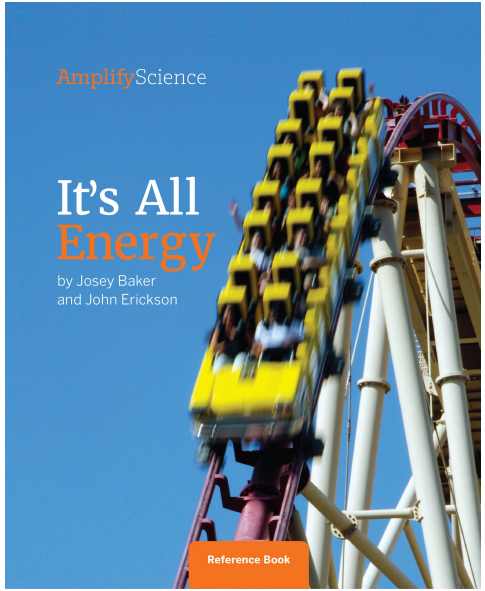
Do: Electrical systems with different energy outputs

Students build simple electrical systems and observe electrical devices that have light, sound, or motion energy as energy outputs.

Energy Conversions Lesson 1.5

Read: It's All Energy

Students prepare to read and navigate the text independently, the teacher introduces the *It's All Energy* reference book,



Energy Conversions Lesson 1.5

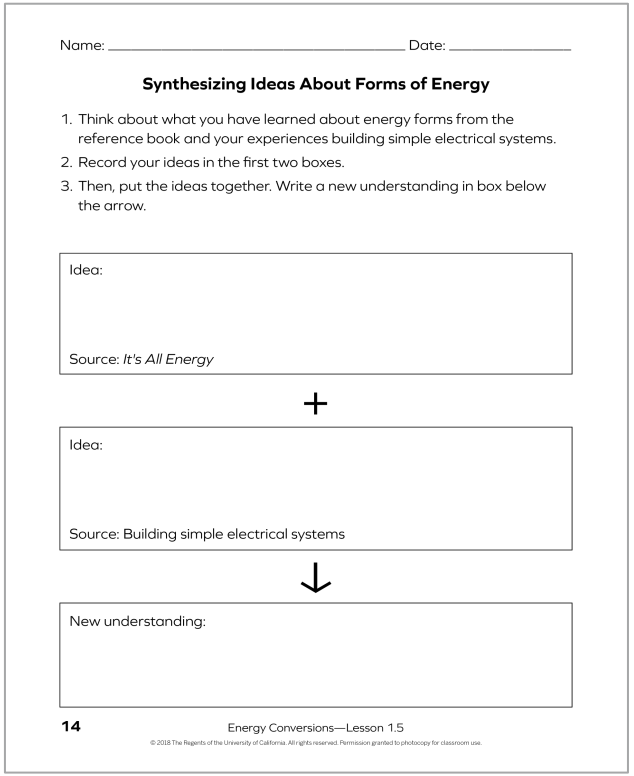
Talk: Discuss text features

Students discuss text features from the reference book *It's All Energy*.

Energy Conversions Lesson 1.5

Write: Discuss forms of energy

Students synthesize information from the book and how their own lives are made possible because of energy.



Name: _____ Date: _____

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Idea:

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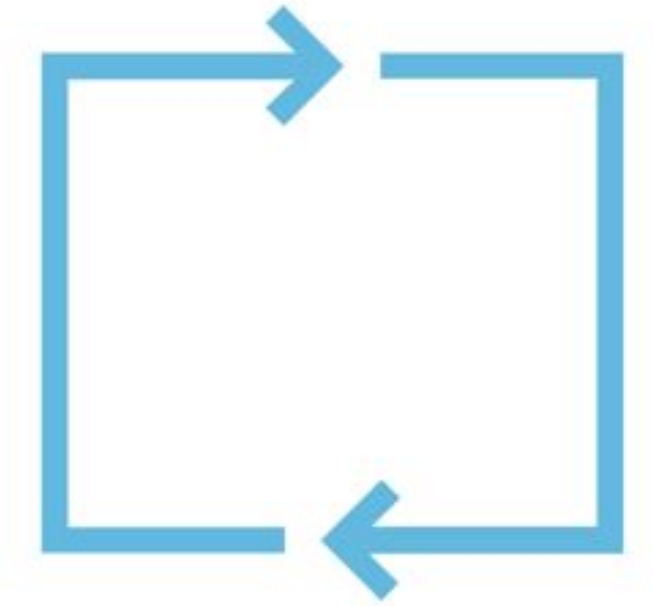
↓

New understanding:

Lesson 1.5 Multimodal learning



Do Building an electrical system with different energy outputs

Talk Talking discuss text features and forms of energy

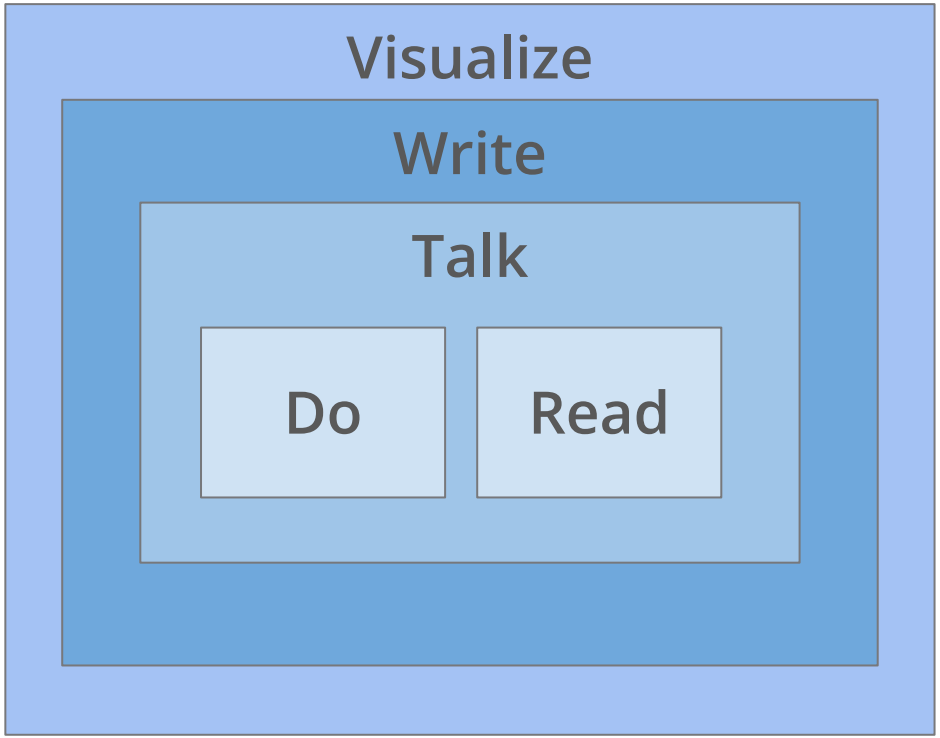
Read Reading about forms of energy

Write Synthesizing information from the book and their own lives.

Visualize

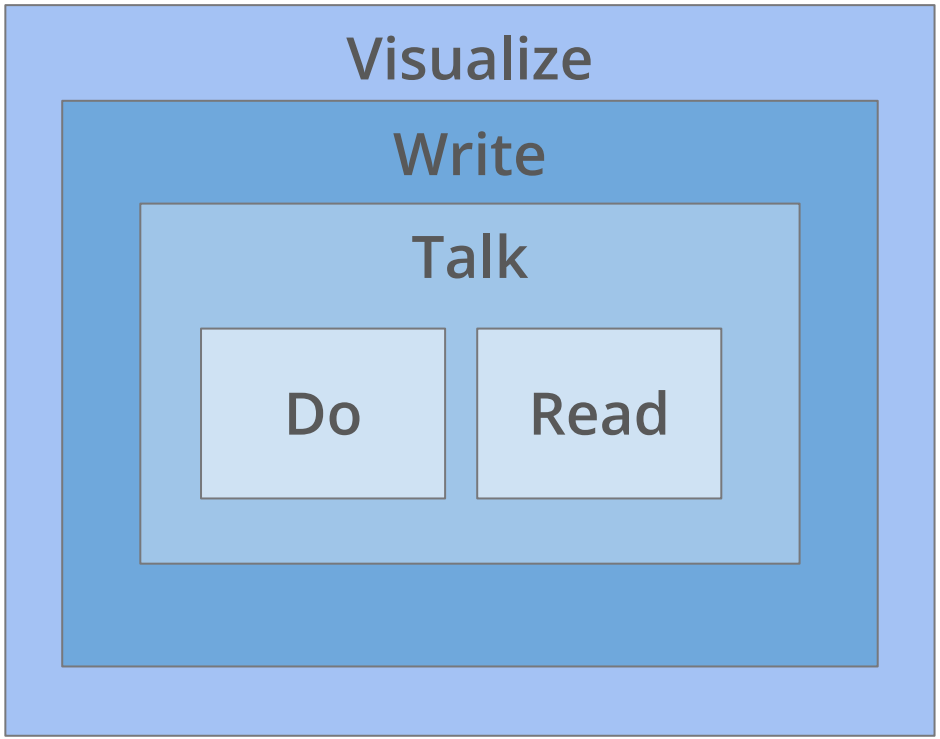
Multimodal instruction (multiple at bats)

Activities of different modalities are intentionally sequenced to support deep understanding of complex concepts.



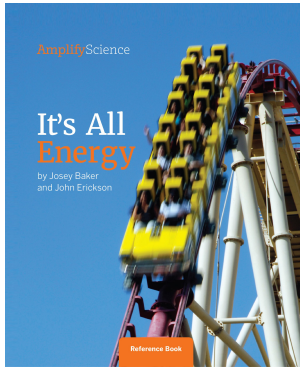
Reflection

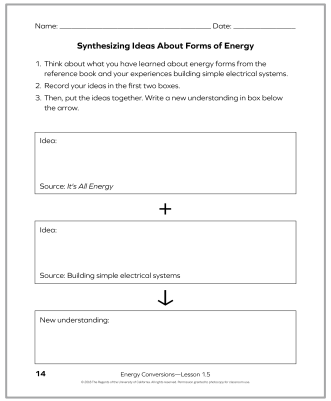
How will multiple at-bats with multimodal evidence sources support diverse learners in your class to master complex science ideas?



Evidence sources work together

Teacher tip: Every evidence source plays an important role in student learning. Be sure to teach every activity in order!




Name: _____ Date: _____

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Source: *It's All Energy*

+

Idea:

Source: Building simple electrical systems

↓

New understanding:

Energy Conversions: Chapter 1

Chapters

Chapter 1: What happened to the electrical system the night of the blackout?

LESSON 1.1
Pre-Unit Assessment

LESSON 1.2
Introducing Systems

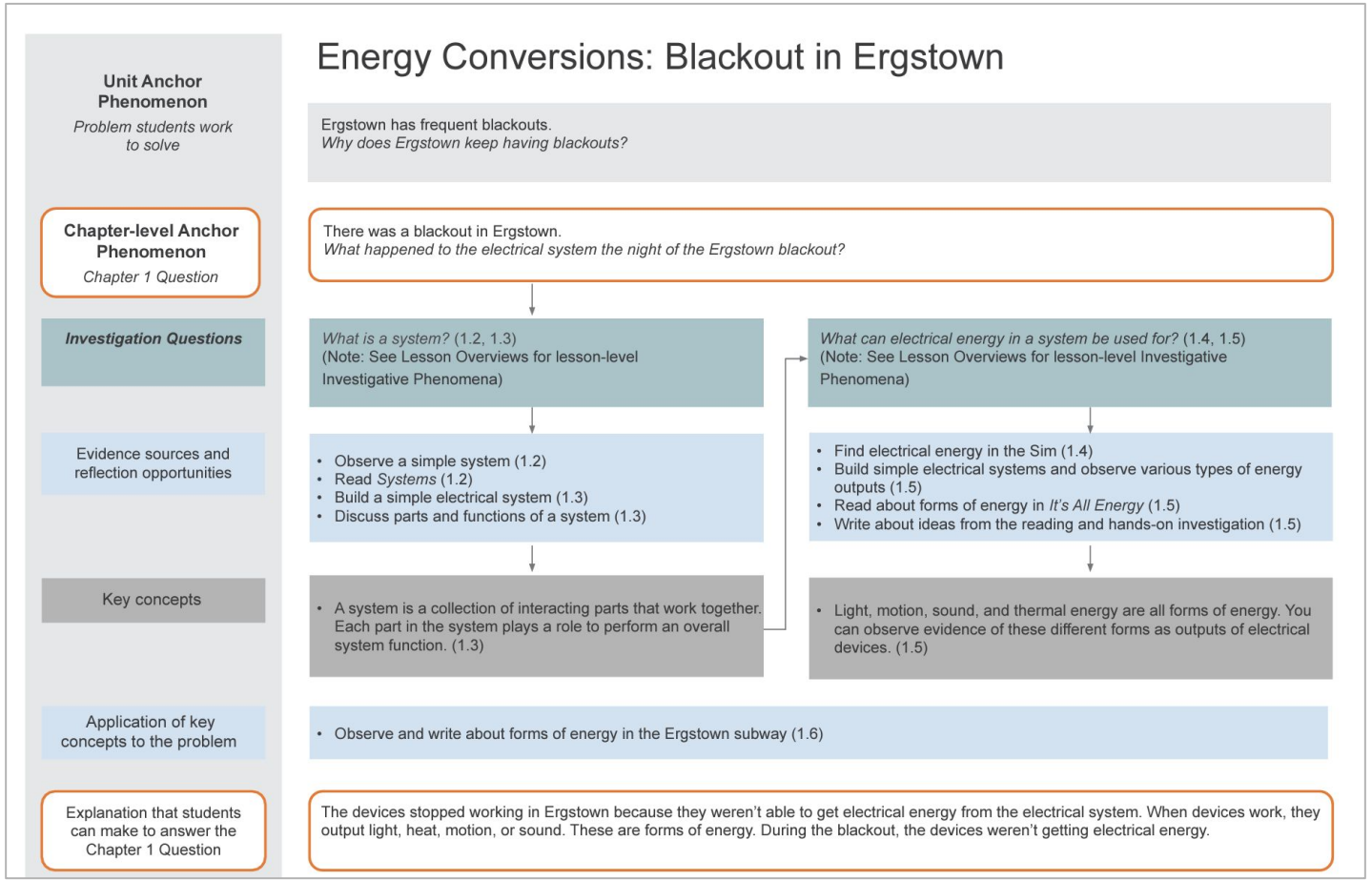
LESSON 1.3
Exploring Systems

LESSON 1.4
Electrical Energy

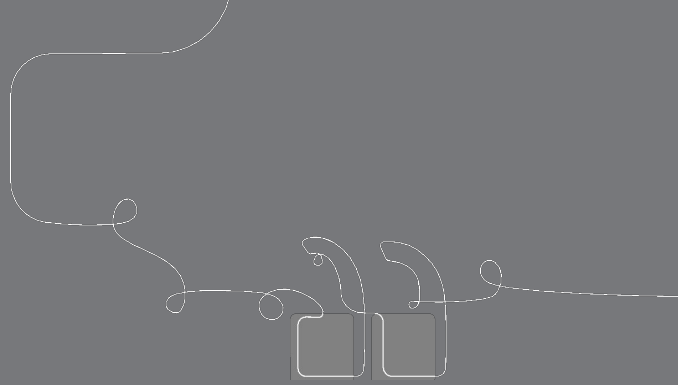
LESSON 1.5
Forms of Energy

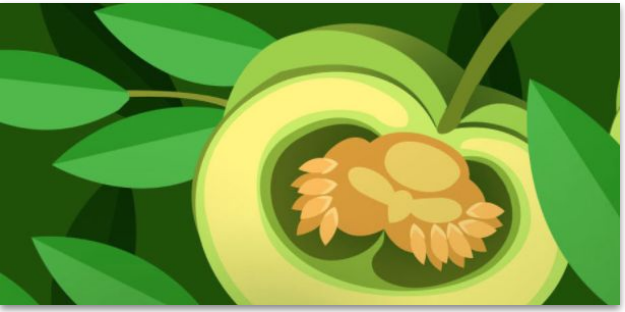
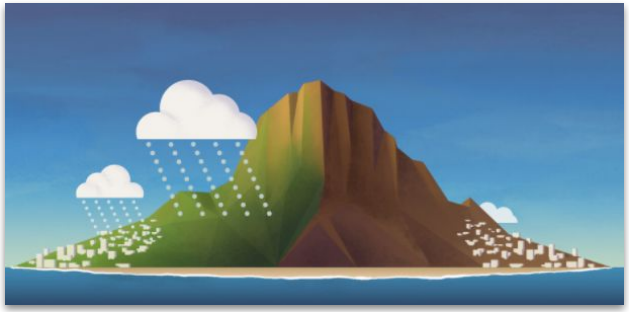
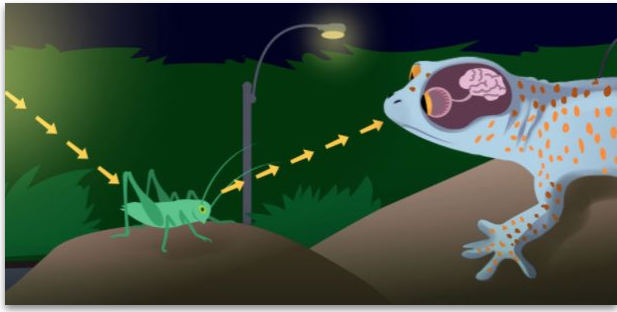
LESSON 1.6
Writing an Argument About the Blackout

Energy Conversions: Blackout in Ergstown



Questions?



Plan for the day

- Introduction and framing
- Unit Internalization
- Digging into Chapter 1
- Model Lesson
- Digging into Chapter 2
- Planning
- Closing

Energy Conversions: Chapter 2

Chapter 2: What makes the devices in Ergstown output or fail to output energy?

LESSON 2.1
Energy Converters

LESSON 2.2
Energy Past and Present

LESSON 2.3
Energy in the System

LESSON 2.4
Design Arguments About Devices

Digging into Chapter 2

Group Work time

1. In your group, pick a lesson in Chapter 2
2. Using the classroom slides, each group member will present an activity
3. Be prepared to **teach** at least 1 activity in the lesson.

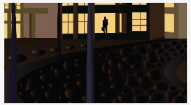
Presentations

Chapter 2: What makes the devices in Ergstown output or fail to output energy?

LESSON 2.1
Energy Converters

LESSON 2.2
Energy Past and Present

LESSON 2.3
Energy in the System



LESSON 2.4
Design Arguments About Devices

Energy Conversions: Blackout in Ergstown

Unit Anchor Phenomenon
Problem students work to solve

Ergstown has frequent blackouts.
Why does Ergstown keep having blackouts?

Chapter-level Anchor Phenomenon
Chapter 2 Question

During the blackout in Ergstown, all the lights and other electrical devices stopped working.
What makes the devices in Ergstown output energy or fail to output energy?

Investigation Questions

How do devices have so many different output energy forms when they are plugged into the same electrical system? (2.1, 2.2)
(Note: See Lesson Overviews for lesson-level Investigative Phenomena)

Why would electrical devices stop converting energy? (2.3, 2.4)
(Note: See Lesson Overviews for lesson-level Investigative Phenomena)

Evidence sources and reflection opportunities

- Read about energy converters in *It's All Energy* (2.1)
- Build electrical systems in the Sim (2.1)
- Use the sorting tool to identify input and output forms (2.2)
- Read *Energy Past and Present* (2.2)
- Write about ideas from the book and the hands-on investigation (2.2)

- Observe an electrical system with too many devices connected for the energy source to power (2.3)
- Observe a physical model of an electrical system (2.3)
- Test energy systems in the Sim (2.4)
- Gather evidence about LED lights from *It's All Energy* (2.4)

Key concepts

- Energy can change from one form to another form. One way energy can change is through an electrical device. (2.2)

- Devices will not have energy to function if they need more energy from the system than is put into the system. (2.3)
- Engineers argue for one solution over others based on how well it meets criteria. (2.4)

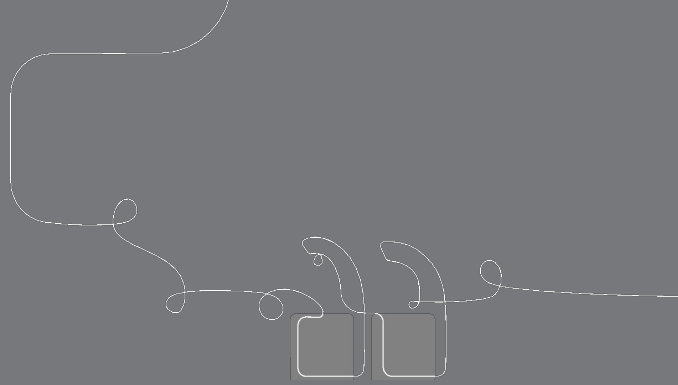
Application of key concepts to the problem

- Categorize different possible changes to Ergstown's electrical system 2.3)
- Discuss criteria and solutions for Ergstown (2.3)
- Write a design argument about the best solution for Ergstown (2.4)

Explanation that students can make to answer the Chapter 2 Question

Energy isn't created or destroyed. When devices get electrical energy, they can convert it into light, heat, motion, or sound because these are all forms of energy. When all the devices were running, they caused a blackout. The devices needed more energy from the electrical system than was available. Either the town was using too many devices, or the devices were not energy-efficient enough. If more energy is needed from the electrical system than is available, a blackout can occur.

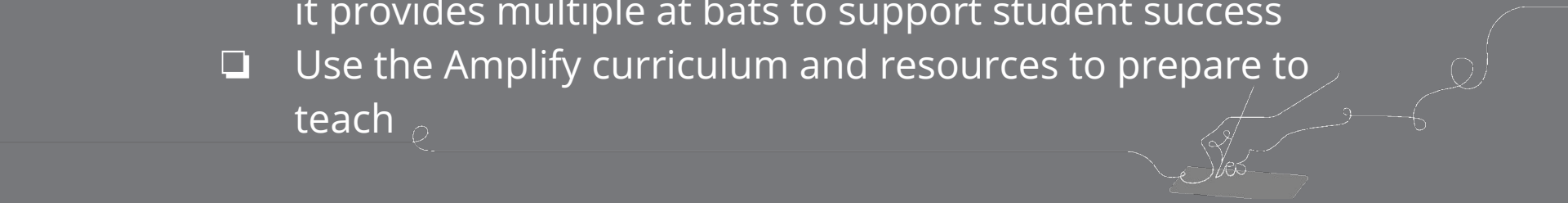
Questions?



Goals for the day:

By the end of the day, you will:

- ✓ Experience how all the instructional components fit together in the context of the unit
- ✓ Gain a deeper understanding of the purposeful sequencing of each activity and lesson within a chapter
- ✓ Become more familiar with multimodal instruction and how it provides multiple at bats to support student success
- ❑ Use the Amplify curriculum and resources to prepare to teach

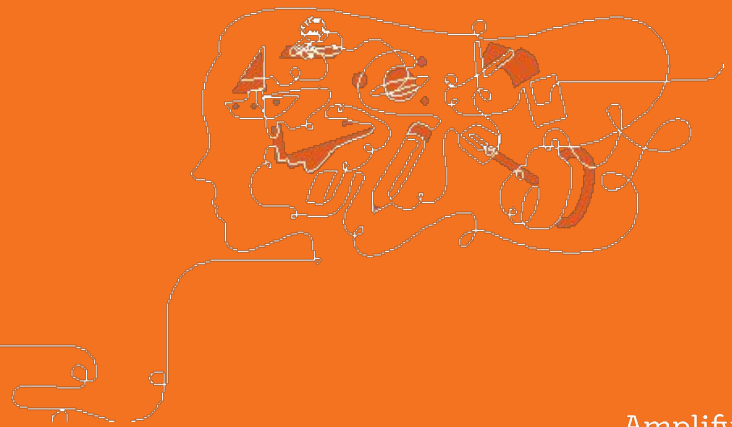


(reminder: after lunch go to auditorium)

LAUSD SUMMER INSTITUTE 2023

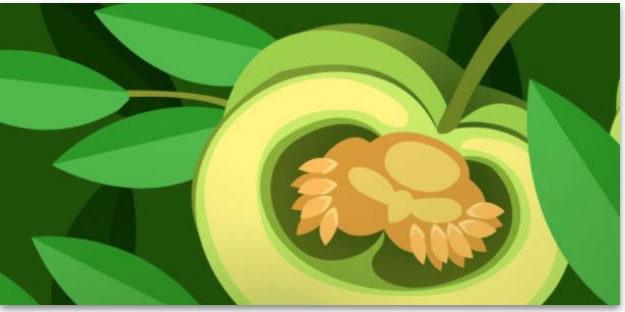
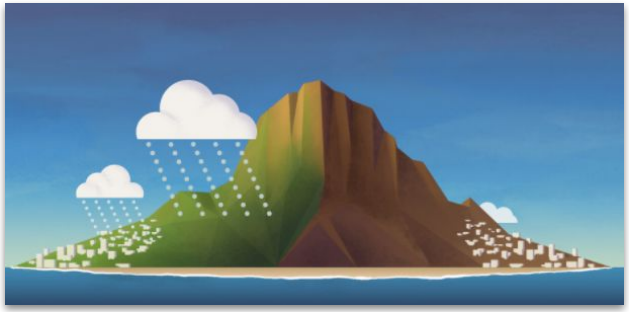
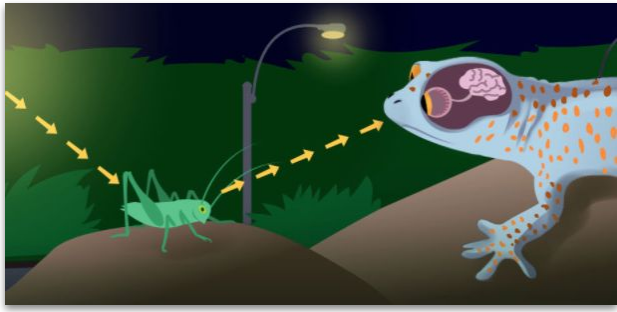
Session 2 (after lunch)
UCLA Center X Presentation

Lunch Break



LAUSD SUMMER INSTITUTE 2023

Session 3
Planning

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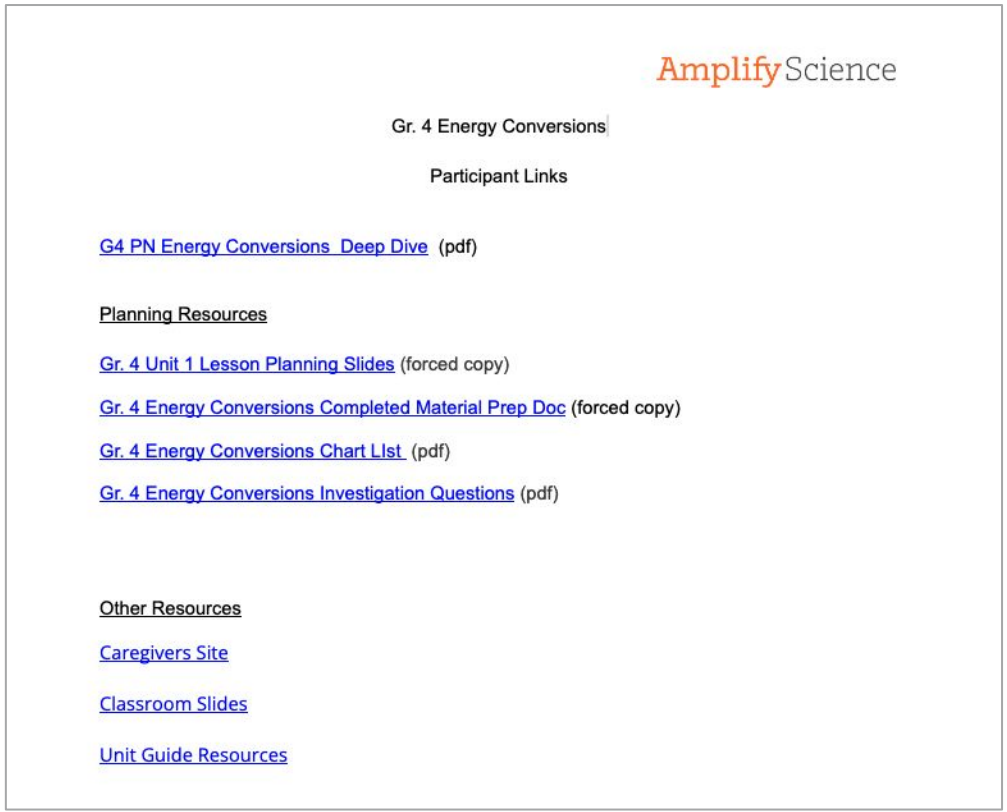
Planning Resources Links



Amplify Science

Gr. 4 Energy Conversions

Participant Links

G4 PN Energy Conversions_Deep Dive (pdf)

Planning Resources

Gr. 4 Unit 1 Lesson Planning Slides (forced copy)

Gr. 4 Energy Conversions Completed Material Prep Doc (forced copy)

Gr. 4 Energy Conversions Chart LIst (pdf)

Gr. 4 Energy Conversions Investigation Questions (pdf)

Other Resources

Caregivers Site

Classroom Slides

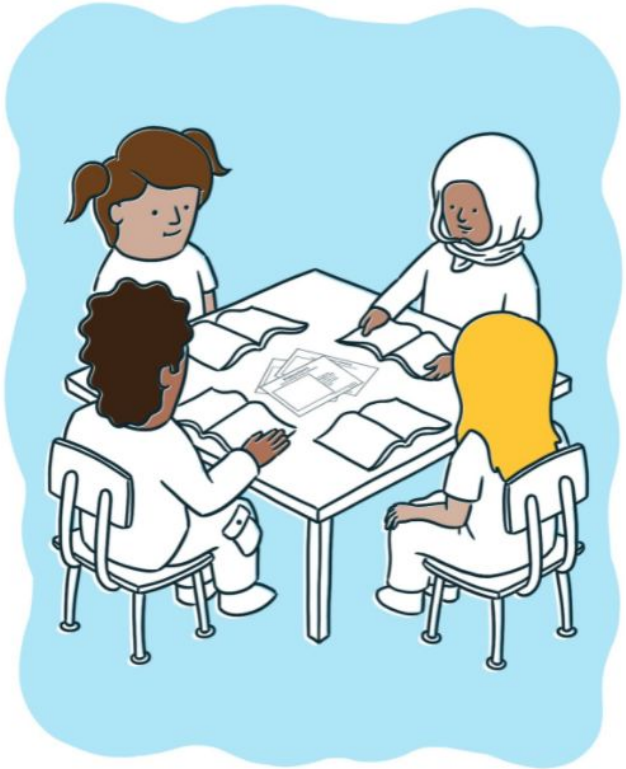
Unit Guide Resources

https://bit.ly/3ZhamPc

Planning time

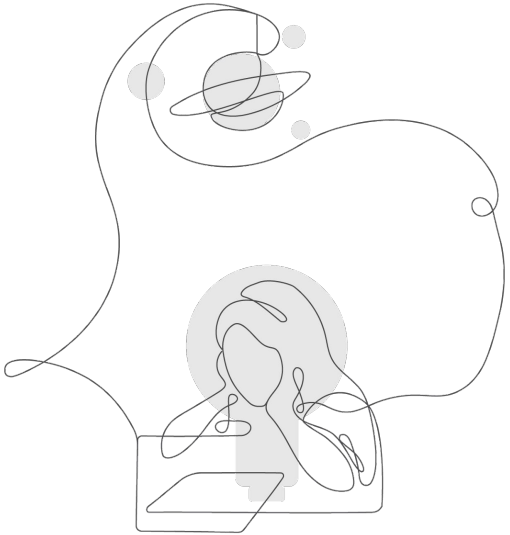
(Be prepared to share what you have been planning)

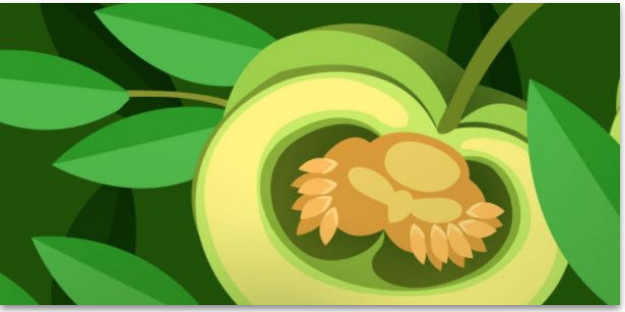
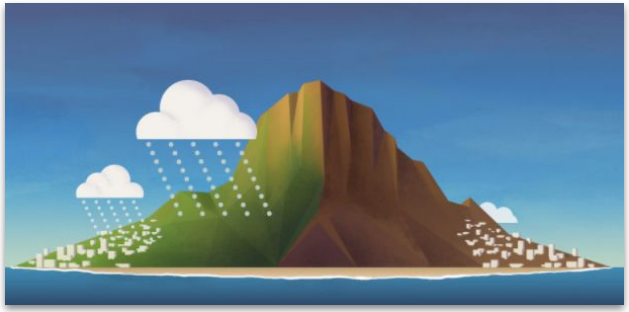
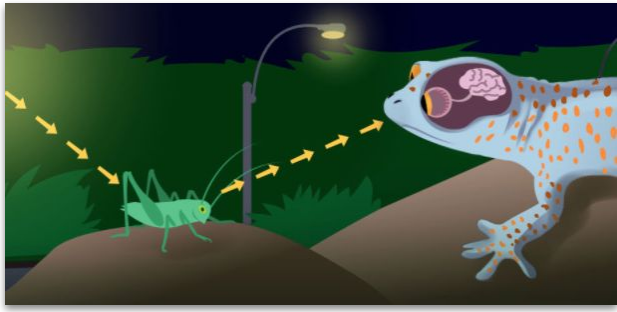
- Suggestions
  - Prep your charts
  - Read your unit's key documents
  - Familiarize yourself with the digital tools and sims
  - Familiarize yourself with the hands on activities
  - Preread the student texts
  - Download all the classroom slides for your unit and put in chapter folders
  - Review the differentiation in lessons and edit slides to meet the needs of your students.



Share Out

- Are you planning differently for the unit after our work today?
    - Have you made any additions to your planning?
    - Have you made any adjustments?



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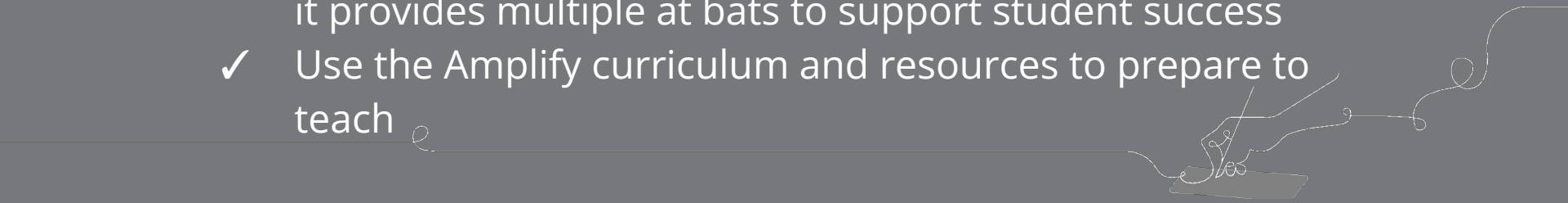
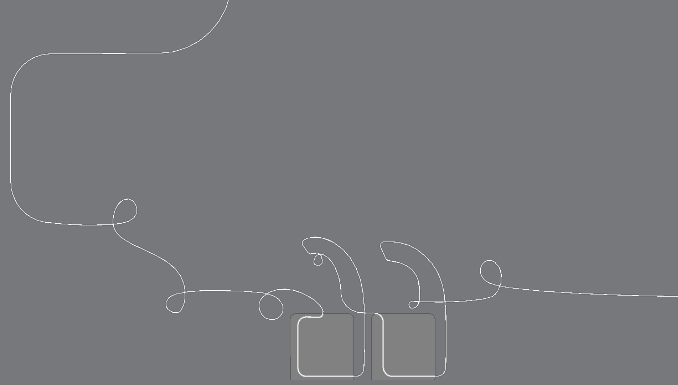


Teaching science



"Science [is] both a body of knowledge and an evidence-based, model and theory building enterprise that continually extends, refines, and revises knowledge."

"Three Dimensional Learning." Three Dimensional Learning | Next Generation Science Standards, www.nextgenscience.org/three-dimensions.

Closing reflection

Based on our work today in Part 2, share:

Head: something you'll keep in mind

Heart: something you're feeling

Feet: something you're planning to do

LAUSD Microsite- https://amplify.com/lausd-science

Welcome to Amplify Science!

This site contains supporting resources designed for the LAUSD Amplify Science adoption for grades TK–8.

- Access the Amplify Science Program Hub (To help orient you to the new design, watch this video and view this reference guide.)
- Find out more about Amplify Science@Home
- Share the Caregiver Hub (Eng/Span) with your families
- For LAUSD ES Teachers- Amplify Science & Benchmark Advance Crosswalk
- Instructional guidance for a Responsive Relaunch of Amplify Science in 21-22

Click the button below to preview the digital Teacher's Guide, and check back for exciting updates to this site!

Additional resources and ongoing support

Customer Care

Seek information specific to enrollment and rosters, technical support, materials and kits, and teaching support, weekdays 7AM-10PM EST and weekends 10AM-6PM EST.

help@amplify.com

800-823-1969

Amplify Chat

Please provide feedback!

Type:

Strengthen

Session title:

Unit one deep dive

Professional Learning Specialist name:

Insert name

(insert email, if you would like)