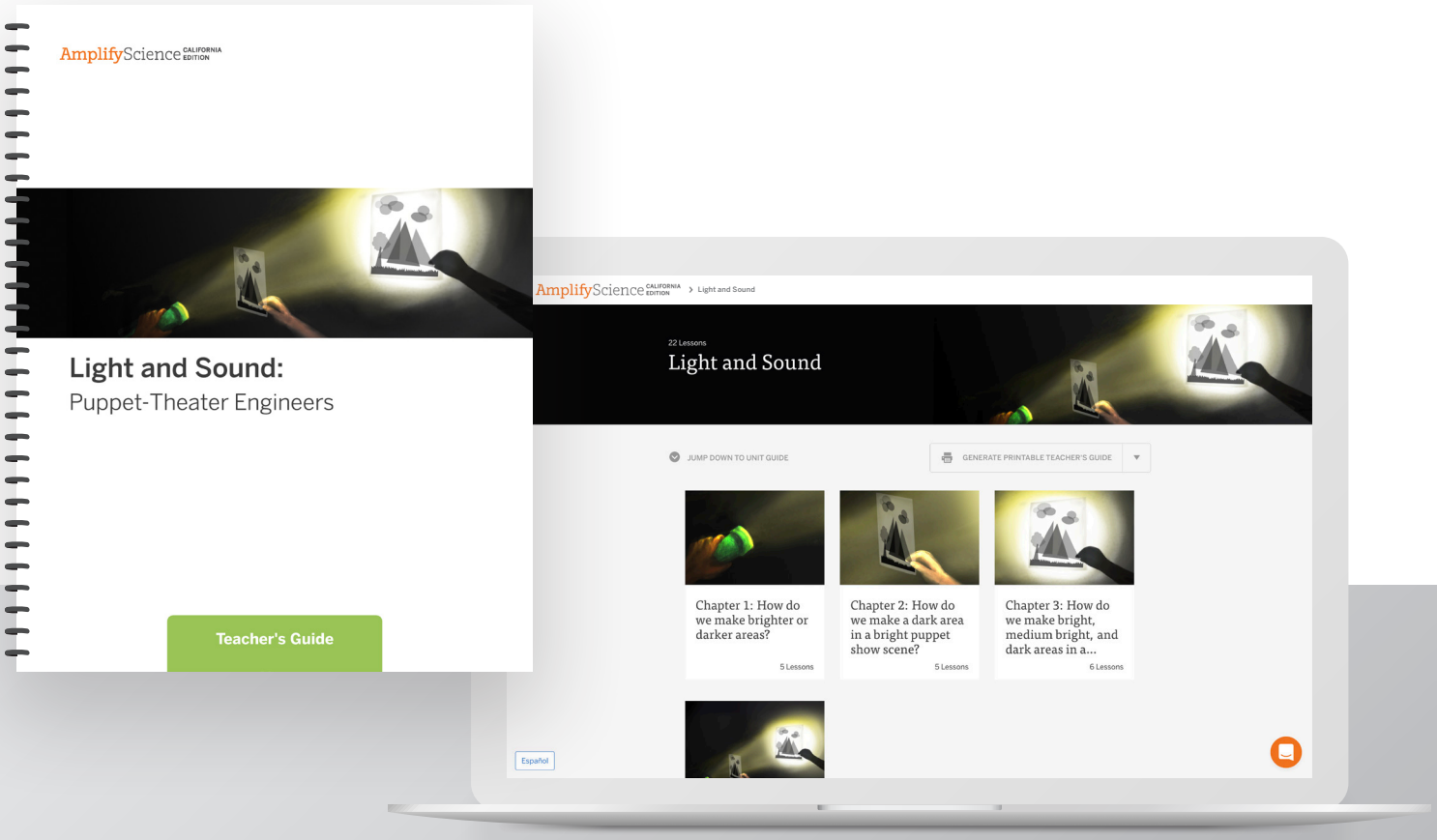
Amplify Science
CALIFORNIA

Grade 1

UNIT GUIDE

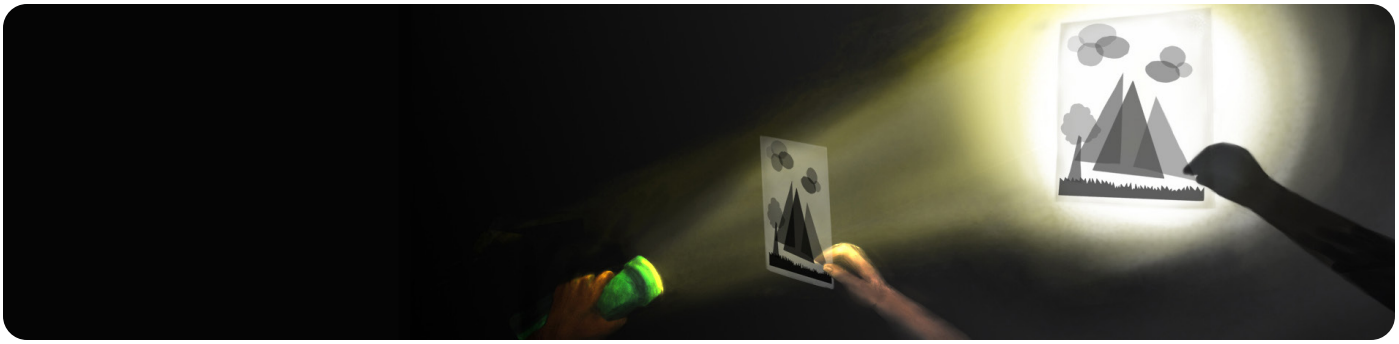
Light and Sound



Amplify.

THE LAWRENCE HALL OF SCIENCE
UNIVERSITY OF CALIFORNIA, BERKELEY

Table of contents



Welcome to Light and Sound

Light and sound are all around us. Yet many students enter the upper-elementary and middle school grades with alternate conceptions about what light and sound are and how they result in what we see and hear. In some ways, this is not surprising since both light and sound have mysterious qualities—some aspects are observable and some are not. Through a series of design challenges, Amplify Science California provides students with concrete experiences and a purpose for learning while also laying the foundation for more sophisticated concepts about light and sound that students will encounter in upper-elementary grades.

> Unlike a typical curriculum, Amplify Science California anchors learning by inviting students to take on the role of scientists and engineers.

In this unit, students take on the role of light and sound engineers. Their job is to design, build, and then project a scene for a puppet show. As light engineers, they investigate how to make different parts of a surface brighter or darker. As sound engineers, they figure out how to create sound sources for their puppet-show scene. By the end of the unit, students will have engaged in several engineering design cycles in which they learn, plan, make, and test different solutions to a problem.

Unit Type: Engineering Design

Student Role: Light and Sound Engineers

Phenomenon: A puppet show company uses light and sound to depict realistic scenes in puppet shows.

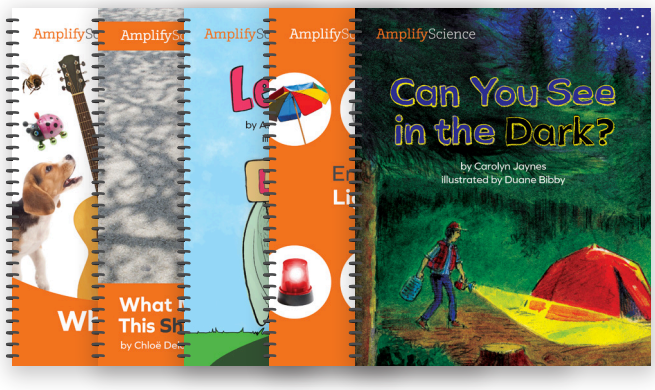
Core Concept: Understanding the nature of light and sound and the role they play in the world around us

Target Performance Expectations:

- 1-PS4-1: Sound and Vibration
- 1-PS4-2: Seeing Requires Light
- 1-PS4-3: Light Interaction with Materials
- 1-PS4-4: Light and Sound for Communication
- K-2-ETS1-1: Defining the Problem
- K-2-ETS1-2: Developing Possible Solutions
- K-2-ETS1-3: Comparing Different Solutions

Students figure out the unit phenomenon through the use of a variety of resources.

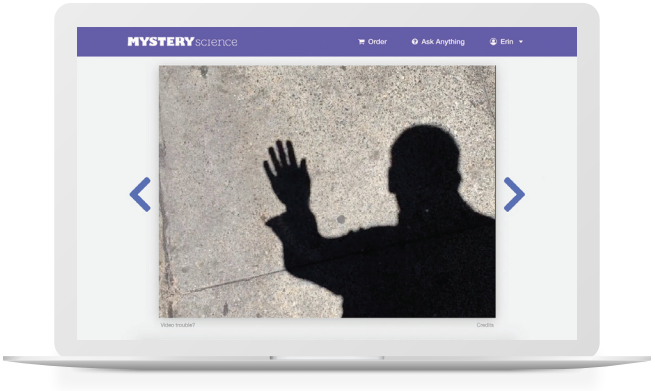
Big Books



Student Books

Hands-On Kit

Videos



About technology in this unit:
Amplify Science California gives you the flexibility to use technology in the way that meets your needs best. In K–2, teachers have the option of using:

- **Student digital licenses** that allow for online completion of work, teacher feedback and grading, and digital class management.
- **Traditional consumable resources** that allow for a more familiar paper and pencil experience.

Whether students use the student digital experience or print workbooks, there are some technology-based activities all students will experience from time to time. In grade 1, these activities are limited to digital readers and other media (i.e., videos, images).

About reading in this unit:
In grade 1, students are never asked to read alone. Rather, books are read *to, with,* and *by* students with ample scaffolding and support provided by the teacher. Big books are used to introduce ideas through read-aloud and shared reading experiences. Matching student books allow for small-group reading and reading in pairs.

Chapter 1:
The storyline begins

What students investigate:

How do we make brighter or darker areas on a surface?

What they figure out:

Without light, we cannot see. Light comes from a source and travels to a surface. Light from the source must be getting to the surface in order to make some parts of the surface look bright. If there is no light source, a surface looks dark.

How they figure it out:

- Making several failed attempts to make the classroom completely dark
- Hunting for light sources in their classroom and school
- Considering whether one can see in the dark during a read aloud of the big book *Can You See in the Dark?*
- Investigating a series of questions with their own light source (a flashlight)
- Investigating how light gets to a surface

KEY


HANDS-ON


READING


STUDENT-TO-STUDENT DISCUSSION


TEACHER


TEACHER-LED DISCUSSION


WRITING

DAY 1 | LESSON 1.1

Pre-Unit Assessment

- Leading a Pre-Unit-Assessment Conversation (15 min)
- Introducing the Context of the Unit (10 min)
- Introducing Engineering (15 min)
- Reflecting on the Role of Engineers (5 min)

Pre-Unit Assessment

DAY 2 | LESSON 1.2

Can You See in the Dark?

- Reviewing Engineering Vocabulary (5 min)
- Exploring How Dark It Can Get (10 min)
- Observing a Dark Place (5 min)
- Reading *Can You See in the Dark?* (15 min)
- Introducing the What We Know About Light Chart (10 min)

On-the-Fly Assessment

DAY 3 | LESSON 1.3

Light-Source Hunt

- Introducing Light Sources (10 min)
- Introducing the Investigation Notebook (5 min)
- Conducting the Light-Source Hunt (15 min)
- Debriefing the Light-Source Hunt (15 min)

On-the-Fly Assessment

DAY 4 | LESSON 1.4

Making Sense of Light Sources and Brightness

- Writing About Light-Source Observations (15 min)
- Revisiting *Can You See in the Dark?* (15 min)
- Introducing Cause and Effect (15 min)

On-the-Fly Assessment

DAY 5 | LESSON 1.5

Light Makes Surfaces Look Bright

- Exploring How to Make Surfaces Bright (15 min)
- Diagramming Light on a Surface (15 min)
- Explaining Bright and Dark Surfaces (15 min)

Critical Juncture Assessment
Self-Assessment

Chapter 2: The storyline builds

What students investigate:

How do we make a dark area in a bright puppet show scene?

What they figure out:

A dark area is the result of putting an object between a light source and a surface. When an object blocks a light source, the surface behind the object looks darker. This dark area is called a shadow.

How they figure it out:

- Exploring how to make shadows on different surfaces
- Investigating how to make a dark area on the surface by using different materials to block light from reaching a surface
- Investigating why some objects block all light, while others let some light pass through during a shared reading of the big book *What Made This Shadow?*

KEY


HANDS-ON


READING


STUDENT-TO-STUDENT DISCUSSION


TEACHER


TEACHER-LED DISCUSSION


WRITING

DAY 6 | LESSON 2.1

Exploring Shadows

- Introducing the Chapter (5 min)
- Exploring Shadows (15 min)
- Debriefing the Shadow Exploration (10 min)
- Recording Engineers' Notes About Shadows (15 min)

On-the-Fly Assessment

DAY 7 | LESSON 2.2

What Made This Shadow?

- Reading *What Made This Shadow?* (15 min)
- Introducing the Blocking Model (5 min)
- Sorting Shadow Cards (15 min)
- Writing About Shadows (10 min)

On-the-Fly Assessment

DAY 8 | LESSON 2.3

Investigating Blocking

- Setting Up the Blocking Investigation (15 min)
- Investigating Blocking (15 min)
- Debriefing the Blocking Investigation (15 min)

On-the-Fly Assessment

DAY 9 | LESSON 2.4

Designing a Cutout to Make a Dark Area

- Introducing the Engineering Task (10 min)
- Designing Solutions (10 min)
- Testing Solutions, Recording Observations (15 min)
- Evaluating Solutions (10 min)

Critical Juncture Assessment

DAY 10 | LESSON 2.5

Explaining the Dark Part of the Surface

- Reflecting on How We Were Engineers (15 min)
- Modeling How a Material Blocks Light (10 min)
- Writing to Explain the Dark Area (15 min)
- Reflecting on Making a Dark Area (5 min)

Self-Assessment

Chapter 3:
The storyline goes deeper

What students investigate:

How do we make bright, medium bright, and dark areas in a puppet show scene?

What they figure out:

Different materials let different amounts of light pass through. Bright areas are the result of all or almost all the light passing through an object and reaching a surface. This happens if there is no object or if the object is transparent. Medium-bright areas result when only some of the light passes through and reaches the surface. Dark areas happen because no light passes through an object. Light is blocked, so the surface looks dark.

How they figure it out:

- Refining their understanding of how light interacts with different materials
- Planning, making, testing, and revising their own shadow scene
- Learning about the design process as they partner read *Let's Test!*
- Writing explanations of their scenes for the puppet show company

KEY


HANDS-ON


READING


STUDENT-TO-STUDENT DISCUSSION


TEACHER


TEACHER-LED DISCUSSION


WRITING

DAY 11 | LESSON 3.1

Investigating Materials That Do Not Block

- Introducing the Chapter (10 min)
- Investigating Materials That Do Not Block (20 min)
- Debriefing the Materials Testing (15 min)

On-the-Fly Assessment

DAY 12 | LESSON 3.2

Let's Test!

- Reading *Let's Test!* (15 min)
- Summarizing Lemonade-Stand Tests (5 min)
- Making Sense of Light Passing Through (10 min)
- Explaining Different Bright and Dark Surfaces (15 min)

On-the-Fly Assessment

DAY 13 | LESSON 3.3

Making Sense of Full and Partial Transmission

- Modeling Bright and Medium-Bright Areas (15 min)
- Reflecting on Full and Partial Transmission (15 min)
- Searching the Reference Book (15 min)

DAY 14 | LESSON 3.4

Young Offspring

- Revisiting the Design Goals (10 min)
- Planning the Stencils (15 min)
- Building the Stencils (20 min)

Critical Juncture Assessment

DAY 15 | LESSON 3.5

Exploring Parental Care

- Rereading *Let's Test!* (15 min)
- Testing and Revising Our Solutions (15 min)
- Recording Observations (15 min)

DAY 16 | LESSON 3.6

Young Offspring

- Sharing Our Puppet Show Scenes (15 min)
- Writing About Our Puppet Show Scenes (15 min)
- Reflecting on How We Were Engineers (15 min)

On-the-Fly Assessment
Self-Assessment

Chapter 4:
Application to a new context

What students investigate:

In their new role as sound engineers, students help the puppet theater company add sound effects to the puppet-show scenes. They think deeply about sound, sound sources, and vibration, and engage in the design cycle to create sound sources that will address the company's challenges.

KEY


HANDS-ON


READING


STUDENT-TO-STUDENT DISCUSSION


TEACHER


TEACHER-LED DISCUSSION


WRITING

What they figure out:

Sound has a source, just like light does. Sound is made when an object vibrates. The object that vibrates is the source of the sound. Like light, sound also travels. Sound travels from the source to our ears. You can start and stop sound by starting and stopping the vibration of an object.

How they figure it out:

- Hunting for sound sources
- Investigating how sounds are made
- Explaining what vibrates in a particular sound source
- Planning, making, testing, and revising different ways of making sound effects
- Exploring familiar object and their sounds, and identifying what part of the object vibrates to make that sound during a shared reading of the big book *What Vibrates?*
- Sharing what they learn in a mini-book they create for the puppet show company

DAY 17 | LESSON 4.1

Exploring Sound Sources

- Introducing the Sound-Engineering Problem (5 min)
- Conducting the Sound-Source Hunt (5 min)
- Investigating Sound Sources (25 min)
- Exploring Sound Sources in the Reference Book (10 min)

DAY 18 | LESSON 4.2

Exploring Sound Sources

- Observing Sound (5 min)
- Investigating Vibration (20 min)
- Debriefing Observations of Sound Sources (5 min)
- Reading *What Vibrates?* (15 min)

On-the-Fly Assessment

DAY 19 | LESSON 4.3

Explaining Vibration in Sound Sources

- Reflecting on Sound and Vibration (10 min)
- Rereading *What Vibrates?* (15 min)
- Introducing the Mini-Book (5 min)
- Writing the Mini-Book (15 min)

On-the-Fly Assessment

DAY 20 | LESSON 4.4

Designing Sound Sources

- Introducing Sound-Sources Design (5 min)
- Planning and Making Sound Sources (15 min)
- Testing and Discussing Sound Sources (10 min)
- Evaluating and Revising Sound Sources (10 min)
- Reflecting on How We Were Engineers (5 min)

Critical Juncture Assessment

DAY 21 | LESSON 4.5

Exploring Parental Care

- Modeling How to Complete the Mini-Book (10 min)
- Finishing and Sharing Mini-Books (10 min)
- Sharing Solutions (15 min)
- Reviewing the Unit (10 min)

On-the-Fly Assessment
Self-Assessment

DAY 22 | LESSON 4.6

Young Offspring

- Talking with Students About Their Animals and Models

End-of-Unit Assessment

All students. All standards.

Rather than treating the standards simply as a list of topics to cover, we designed Amplify Science California to allow for truly in-depth and integrated coverage of the disciplinary core ideas (DCIs), science and engineering practices (SEPs), and crosscutting concepts (CCCs). Unlike other programs, however, ours makes the NGSS' vision of "all students, all standards" a reality by creating a unit-specific learning progression for every unit called a Progress Build.

Each Progress Build defines several levels of understanding of the unit's anchoring phenomenon, with each level integrating and building upon the knowledge and skills from lower levels. In this way, each Progress Build provides a clear roadmap for how students' understanding of the phenomenon is expected to deepen and develop with each successive chapter and lesson.

What's more, the program's system of assessments is also tied to these Progress Builds. This carefully crafted integration provides teachers with credible, actionable, and timely diagnostic information about student progress toward the unit's learning goals and grade-level performance expectations. Armed with this powerful data, teachers have the ultimate flexibility to decide when to move on and when to slow down and dive deeper.

Light and Sound Progress Build

The Progress Build in this unit consists of three levels of understanding. At each level, students add new ideas and integrate them into a progressively deeper understanding of how light from a single light source interacts differently with different materials to produce areas with varying levels of brightness.

Progress Build Level 1:
Light from a source makes surfaces visible and look brighter.

Progress Build Level 2:
Some materials can block light from reaching a surface.

Progress Build Level 3:
Some materials allow all or some light to pass through them.

Examples of differentiation in this unit

In addition to providing unit-specific Progress Builds that break learning goals into smaller, more achievable levels of understanding, Amplify Science California makes learning accessible for all students through a variety of scaffolds, supports, and differentiation strategies for every lesson. **For a complete list of strategies, see the Differentiation section of every Lesson Brief**.

Below are a few examples of strategies embedded in this unit.

For English learners:

Preview the Read-Aloud (Example from Lesson 1.2)
English learners have a variety of resources they bring to a learning task. Often, they have topic knowledge in their primary languages. To maximize these resources, preview the book *Can You See in the Dark?* with students before the Read-Aloud. To assure that students are able to make meaning from the book, have them engage with the pictures and discuss what they notice. You may want to invite them to use their primary languages with a partner who speaks the same primary language. During this time, you can introduce key vocabulary such as *bright*, *dark*, *evidence*, *observe*, *source*, and *surface* to preview the content that will be in the book. You can also point out the cognates in Spanish for some of these words like *evidence/evidencia*, *observe/observer*, and *surface/superficie*. This preview will cue English learners to pay attention to certain information during the Read-Aloud and will increase their chances of gaining new content knowledge.

For students needing more support:

Reading in a small group (Example from Lesson 3.3)
To help prepare students for the Partner Read, you may wish to work with a small group of students to identify a design that lets all the light through. Begin by modeling how you use the table of contents to find the correct page. Then, read the caption and point out what you observe in the photograph. Invite students to find other solutions that let all the light through and note this with a sticky note. Finally, let students work with a partner to find additional designs that let some or none of the light through.

For students ready for a challenge:

Writing like an engineer (Example from Lesson 2.5)
To add a level of complexity for students who are ready for a challenge, suggest that they write additional sentences to incorporate parts of the design cycle in their written explanations in their notebooks. For example, you might invite students to describe the problem they were going to solve and then explain how they solved that problem. Invite students to use the How We Were Like Engineers chart to support their writing.

3-D Statements

In order to help teachers recognize the three-dimensional structure of every unit, chapter, and lesson, each unit contains a 3-D Statement document that makes the integration clear.

Making the 3-D statement document all the more effective, the three dimensions are color-coded for easy recognition.

Light and Sound 3-D Coverage

SEPs
Science and Engineering Practices

DCIs
Disciplinary Core Ideas

CCCs
Cross-Cutting Concepts

Unit Level

Students investigate and construct explanations about how light and sound can be used to create solutions for a puppet-theater company (cause and effect). Students apply what they learn in order to design solutions to create shadow scenery and sound effects for a puppet-theater show (patterns).

Chapter Level

Chapter 1: How do we make brighter or darker areas?

Students investigate and analyze data in order to figure out the relationship between a light source and the brighter and darker areas they observe (cause and effect, patterns).

Chapter 2: How do we make a dark area in a bright puppet show scene?

Students investigate and construct explanations about the effect that some materials can have in blocking light from getting to a surface (cause and effect, patterns).

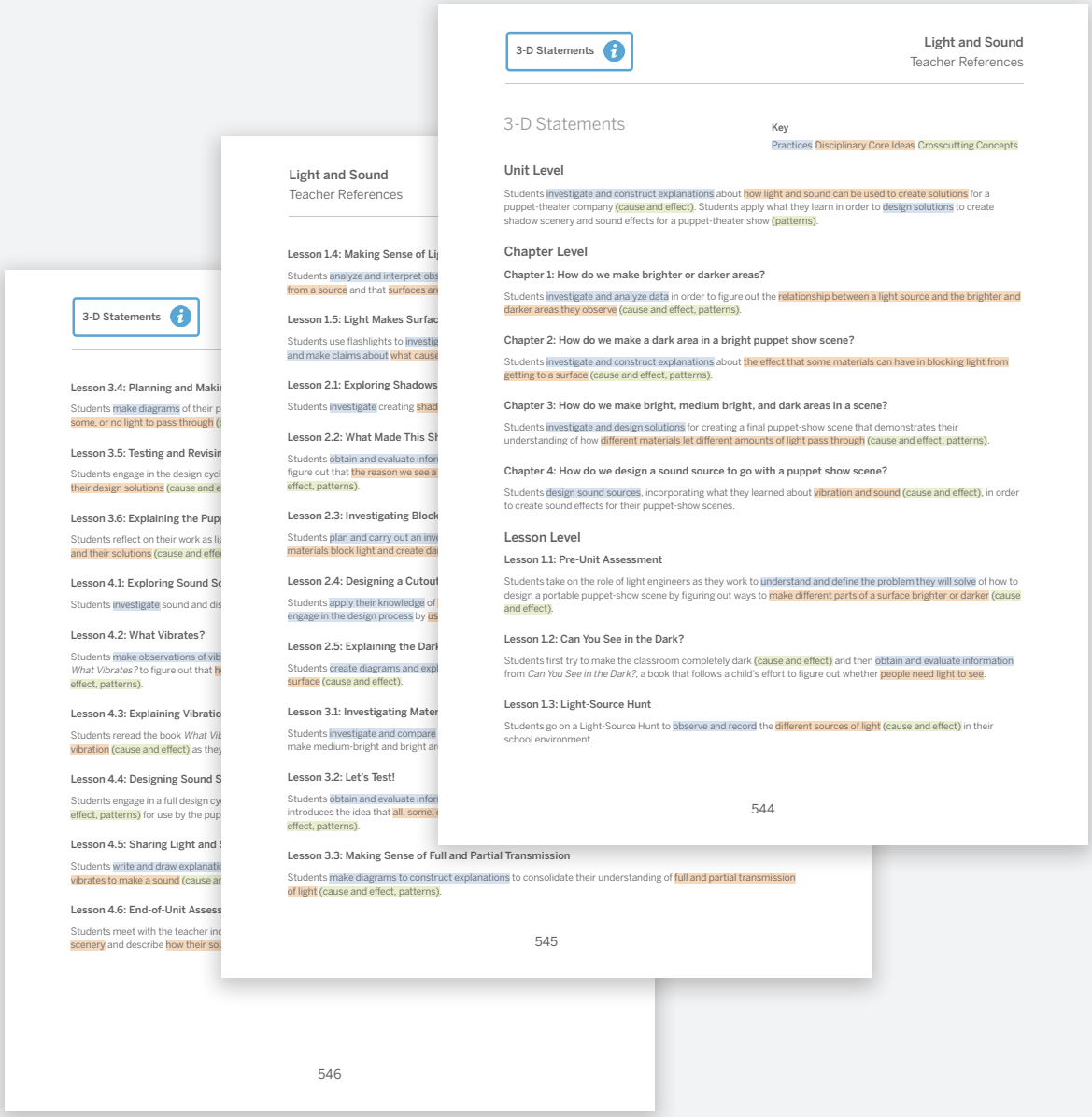
Chapter 3: How do we make bright, medium bright, and dark areas in a scene?

Students investigate and design solutions for creating a final puppet-show scene that demonstrates their understanding of how different materials let different amounts of light pass through (cause and effect, patterns).

Chapter 4: How do we design a sound source to go with a puppet show scene?

Students design sound sources, incorporating what they learned about vibration and sound (cause and effect), in order to create sound effects for their puppet-show scenes.

To review the 3-D Statements at the lesson level, see the Lesson Brief section of every lesson.



3-D Statements

Light and Sound
Teacher References

3-D Statements

Key
Practices Disciplinary Core Ideas Crosscutting Concepts

Unit Level

Students investigate and construct explanations about how light and sound can be used to create solutions for a puppet-theater company (cause and effect). Students apply what they learn in order to design solutions to create shadow scenery and sound effects for a puppet-theater show (patterns).

Chapter Level

Chapter 1: How do we make brighter or darker areas?

Students investigate and analyze data in order to figure out the relationship between a light source and the brighter and darker areas they observe (cause and effect, patterns).

Chapter 2: How do we make a dark area in a bright puppet show scene?

Students investigate and construct explanations about the effect that some materials can have in blocking light from getting to a surface (cause and effect, patterns).

Chapter 3: How do we make bright, medium bright, and dark areas in a scene?

Students investigate and design solutions for creating a final puppet-show scene that demonstrates their understanding of how different materials let different amounts of light pass through (cause and effect, patterns).

Chapter 4: How do we design a sound source to go with a puppet show scene?

Students design sound sources, incorporating what they learned about vibration and sound (cause and effect), in order to create sound effects for their puppet-show scenes.

Lesson Level

Lesson 1.1: Pre-Unit Assessment

Students take on the role of light engineers as they work to understand and define the problem they will solve of how to design a portable puppet-show scene by figuring out ways to make different parts of a surface brighter or darker (cause and effect).

Lesson 1.2: Can You See in the Dark?

Students first try to make the classroom completely dark (cause and effect) and then obtain and evaluate information from *Can You See in the Dark?*, a book that follows a child's effort to figure out whether people need light to see.

Lesson 1.3: Light-Source Hunt

Students go on a Light-Source Hunt to observe and record the different sources of light (cause and effect) in their school environment.

544

Light and Sound
Teacher References

Lesson 1.4: Making Sense of Li

Students analyze and interpret obs
from a source and that surfaces ar

Lesson 1.5: Light Makes Surfac

Students use flashlights to investig
and make claims about what cause

Lesson 2.1: Exploring Shadows

Students investigate creating shad

Lesson 2.2: What Made This Sh

Students obtain and evaluate infor
figure out that the reason we see a
effect, patterns).

Lesson 2.3: Investigating Block

Students plan and carry out an inv
materials block light and create da

Lesson 2.4: Designing a Cutout

Students apply their knowledge of
engage in the design process by us

Lesson 2.5: Explaining the Dark

Students create diagrams and exp
surface (cause and effect).

Lesson 3.1: Investigating Mater

Students investigate and compare
make medium-bright and bright ar

Lesson 3.2: Let's Test!

Students obtain and evaluate infor
introduces the idea that all, some,
effect, patterns).

Lesson 3.3: Making Sense of Full and Partial Transmission

Students make diagrams to construct explanations to consolidate their understanding of full and partial transmission of light (cause and effect, patterns).

545

3-D Statements

Lesson 3.4: Planning and Maki

Students make diagrams of their p
some, or no light to pass through (

Lesson 3.5: Testing and Revisin

Students engage in the design cycl
their design solutions (cause and e

Lesson 3.6: Explaining the Pup

Students reflect on their work as li
and their solutions (cause and effe

Lesson 4.1: Exploring Sound Sc

Students investigate sound and dis

Lesson 4.2: What Vibrates?

Students make observations of vib
What Vibrates? to figure out that h
effect, patterns).

Lesson 4.3: Explaining Vibratio

Students reread the book *What Vib*
vibration (cause and effect) as they

Lesson 4.4: Designing Sound S

Students engage in a full design cy
effect, patterns) for use by the pup

Lesson 4.5: Sharing Light and S

Students write and draw explanatio
vibrates to make a sound (cause an

Lesson 4.6: End-of-Unit Assess

Students meet with the teacher ind
scenery and describe how their sou

546

Notes

Notes

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

Amplify.

THE LAWRENCE HALL OF SCIENCE
UNIVERSITY OF CALIFORNIA, BERKELEY