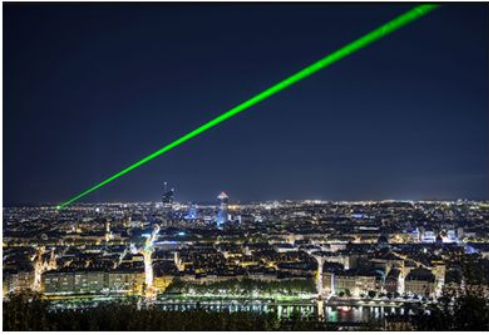


1st Grade Unit 3
12 weeks



Waves: Light & Sound

Unit Planning Team:

Christine Pinkley (ET), Christen McFadden (JD),
Pam Keith (ET)





What happens when materials vibrate?

How does light interact with objects?

How can sound and light be used to communicate over a long distance?

Waves: Light and Sound

Students who demonstrate understanding can:

1-PS4-1 Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate. [Clarification Statement: Examples of vibrating materials that make sound could include striking a tuning fork and plucking a stretched string. Examples of how sound can make matter vibrate could include holding a piece of paper near a speaker making sound and holding an object near a vibrating tuning fork.]

1-PS4-2 Make observations to construct an evidence-based account that objects can be seen only when illuminated.

[Clarification Statement: Examples of observations could include those made in a completely dark room, a pinhole box, and a video of a cave explorer with a flashlight. Illumination could be from an external light source or by an object giving off its own light.]

1-PS4-3 Plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light. [Clarification Statement: Examples of materials could include those that are transparent (such as clear plastic), translucent (such as wax paper), opaque (such as cardboard), or reflective (such as a mirror).] [Assessment Boundary: Assessment does not include the speed of light.]

1-PS4-4 Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.* [Clarification Statement: Examples of devices could include a light source to send signals, paper cup and string "telephones", and a pattern of drum beats.] [Assessment Boundary: Assessment does not include technological details for how communication devices work.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations Planning and carrying out investigations to answer questions or test solutions to problems in K-2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions. Plan and conduct investigations collaboratively to produce data to serve as the basis for evidence to answer a question. (1-PS4-1, 1-PS4-3)	PS4.A: Wave Properties - Sound can make matter vibrate, and vibrating matter can make sound. (1-PS4-1) PS4.B: Electromagnetic Radiation - Objects can be seen if light is available to illuminate them or if they give off their own light. (1-PS4-2) - Some materials allow light to pass through them, others allow only some light through and others block all the light and create a dark shadow on any surface beyond them, where the light cannot reach. Mirrors can be used to redirect a light beam. (Boundary: The idea that light travels from place to place is developed through experiences with light sources, mirrors, and shadows, but no attempt is made to discuss the speed of light.) (1-PS4-3)	Cause and Effect Simple tests can be designed to gather evidence to support or refute student ideas about causes. (1-PS4-1, 1-PS4-2, 1-PS4-3)
Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in K-2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions. - Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena (1-PS4-2) - Use tools and materials provided to design a device that solves a specific problem. (1-PS4-4)	PS4.C: Information Technologies and Instrumentation People also use a variety of devices to communicate (send and receive information) over long distances. (1-PS4-4)	Connections to Engineering, Technology, and Applications of Science Influence of Engineering, Technology, and Science, on Society and the Natural World People depend on various technologies in their lives; human life would be very different without technology. (1-PS4-4)
Connections to Nature of Science Scientific Investigations Use a Variety of Methods - Science investigations begin with a question. (1-PS4-1) - Scientists use different ways to study the world. (1-PS4-1)		

Waves: Light and Sound

Background knowledge videos:

PS4A - Wave Properties

PS4B - Electromagnetic Radiation

PS4C - Information Technologies

These videos are designed to assist in providing background knowledge with the associated DCI. The information in the videos follows the progression through high school.

What happens when materials
vibrate?

Big Ideas

- ★ Sound can make matter vibrate, and vibrating matter can make sound.
- ★ There are different types of sound made by vibrating matter.
- ★ People use a variety of devices to communicate (send/receive information) over long distances.
- ★ Investigations can produce data to give evidence that answers a question.
- ★ Observations help us construct an evidence-based explanation for phenomena.

How does light interact with objects?

Big Ideas

- ★ Light travels from place to place.
- ★ Objects can be seen if light is available to illuminate them or if they give off their own light.
- ★ Some materials allow light to pass through them; others allow only some light through.
- ★ Some materials block all the light and create a dark shadow on any surface beyond them, where light cannot reach.
- ★ Mirrors can be used to redirect a light beam.
- ★ People use a variety of devices to communicate (send/receive information) over long distances.
- ★ Investigations can produce data to give evidence that answers a question.
- ★ Observations help us construct an evidence-based explanation for phenomena.

How can sound and light be used to communicate over a long distance?

Big Ideas

- ★ People use a variety of devices to communicate (send/receive information) over long distances.
- ★ A variety of tools and materials can be used to solve problems.
- ★ Investigations can produce data to give evidence that answers a question.
- ★ Observations help us construct an evidence-based explanation for phenomena.

1-PS4-1

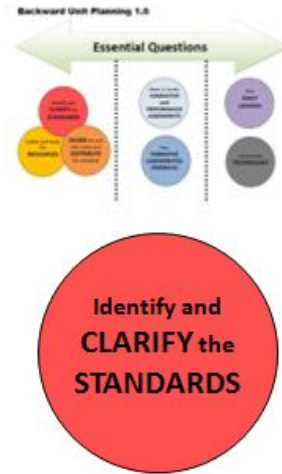
Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.

Clarification Statement: Examples of vibrating materials that make sound could include striking a tuning fork and plucking a stretched string. Examples of how sound can make matter vibrate could include holding a piece of paper near a speaker making sound and holding an object near a vibrating tuning fork.

Disciplinary Core Ideas

PS4.A: Wave Properties

- Sound can make matter vibrate, and vibrating matter can make sound.
(1-PS4-1)



Clarifications:

Watch *Bozemanscience.com* video:

PS4A - Wave Properties

Sound is a form of energy caused by back-and-forth vibrations. Production of sound is a result of vibration of the object itself on the material it comes in contact with, such as air. Some vibrations are obvious, such as watching the strings plucked on a guitar. Others are so small you can't see them. Some vibrations that cannot be seen, can be felt. (Keeley, Eberle, and Farrin) For example, putting your fingers over your vocal chords when you speak or sing.

1-PS4-2 Make observations to construct an evidence-based account that objects can be seen only when illuminated.

Clarification Statement: Examples of observations could include those made in a completely dark room, a pinhole box, and a video of a cave explorer with a flashlight. Illumination could be from an external light source or by an object giving off its own light.

1-PS4-3 Plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light.

Clarification Statement: Examples of materials could include those that are transparent (such as clear plastic), translucent (such as wax paper), opaque (such as cardboard), or reflective (such as a mirror).

Assessment Boundary: Assessment does not include the speed of light.



Disciplinary Core Ideas

PS4.B: Electromagnetic Radiation

- Objects can be seen if light is available to illuminate them or if they give off their own light. (1-PS4-2)
- Some materials allow light to pass through them, others allow only some light through and others block all the light and create a dark shadow on any surface beyond them, where the light cannot reach. Mirrors can be used to redirect a light beam. (Boundary: The idea that light travels from place to place is developed through experiences with light sources, mirrors, and shadows, but no attempt is made to discuss the speed of light.) (1-PS4-3)

Clarifications:

Watch Bozemanscience.com video:

PS4B - Electromagnetic Radiation

When we can see a non-luminous object, we know that some or all of the light striking the object is reflected to our eye.

Otherwise, we would not be able to see it. (Keeley, Eberle, and Farrin)

1-PS4-4 Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.*

Clarification Statement: Examples of devices could include a light source to send signals, paper cup and string “telephones”, and a pattern of drum beats.

Assessment Boundary: Assessment does not include technological details for how communication devices work.

Disciplinary Core Ideas

PS4.C: Information Technologies and Instrumentation

- People also use a variety of devices to communicate (send and receive information) over long distances. (1-PS4-4)



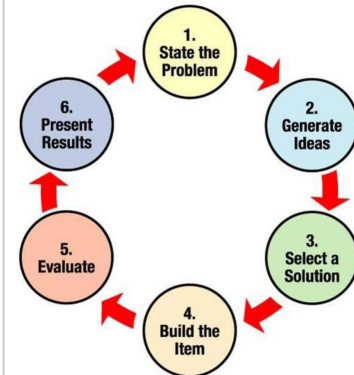
Identify and
CLARIFY the
STANDARDS

Clarifications:

Watch Bozemanscience.com video:

PS4C - Information Technologies

Engineering Design Loop



Discovery Education Techbook:

PHYSICAL SCIENCE

**UNIT:**
Seeing and Hearing
[View Unit ▶](#)

CONCEPT:
Making Sounds
Light

**UNIT:**
Solving Problems
[View Unit ▶](#)

CONCEPT:
Designing Things
Improving Systems

**Gather and
study the
RESOURCES**



District Design Challenge: *The Boy Who Used Light and Sound*

1st Grade ELA Unit 3

The Boy Who Used Light and Sound



The shepherd boy needs another way to communicate with the towns people. Your challenge is to use the tools to communicate what the boy wants to say to your team. He can't scream it because the people won't listen to him anymore. Design a way for him to communicate with light.

Challenge 1:
Flashlights
Tissue paper
Mirrors
Materials that are transparent, opaque, or translucent

1st Grade ELA Unit 3

The Boy Who Used Light and Sound

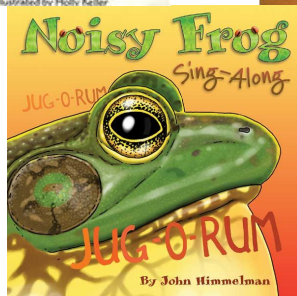
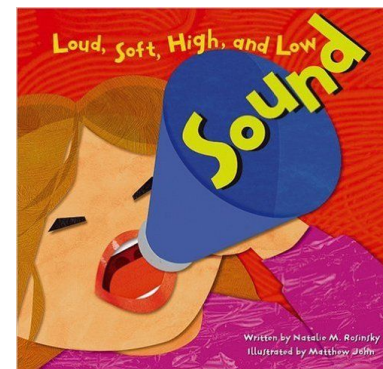
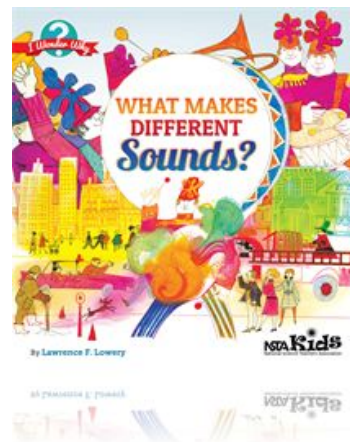
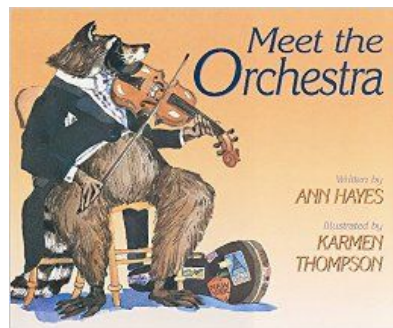
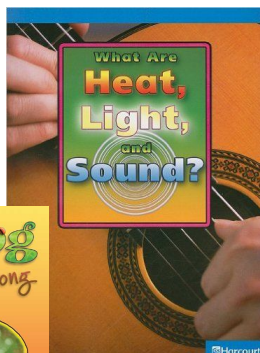
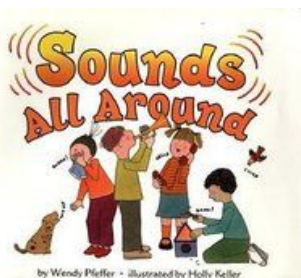
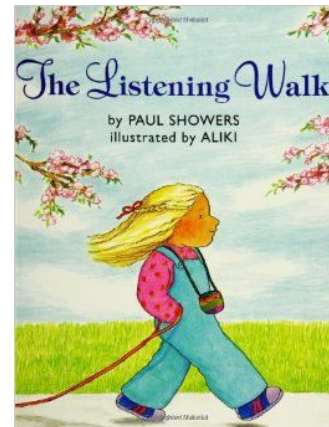
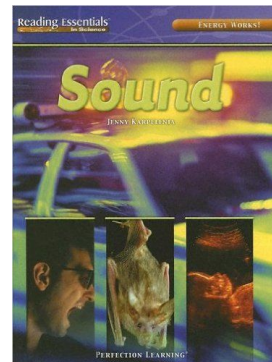
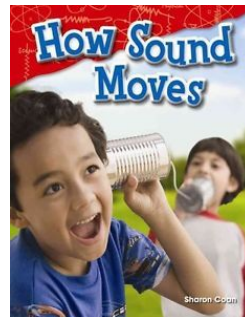
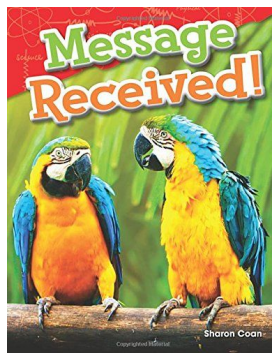
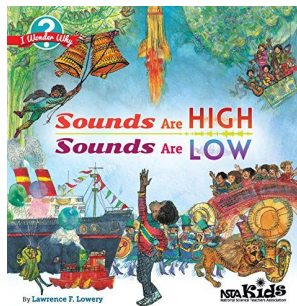
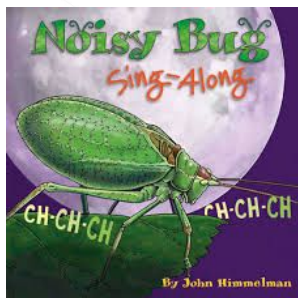


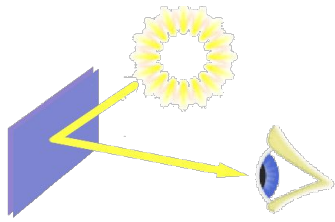
The shepherd boy needs another way to communicate with the towns people. Your challenge is to use the tools to communicate what the boy wants to say to your team. He can't scream it because the people won't listen to him anymore. Design a way for him to communicate with sound.

Challenge 2:
Rings
Jingle bells
Styrofoam cups
String (the length of a snake)
Pencil
Whistles
Musical instruments

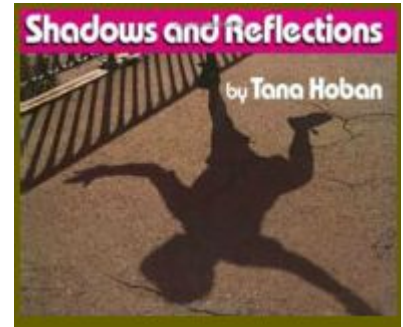
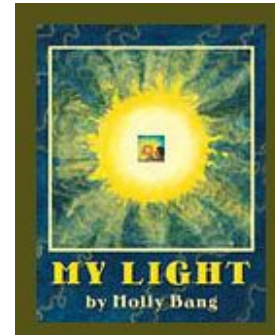
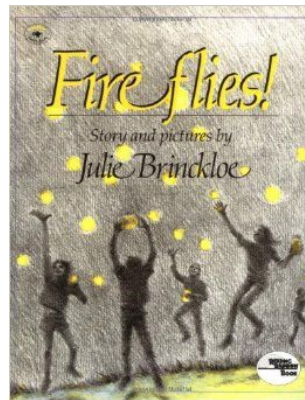
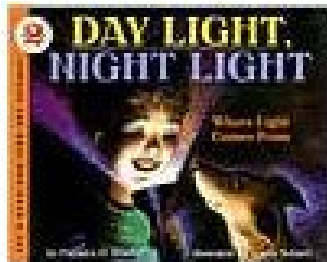
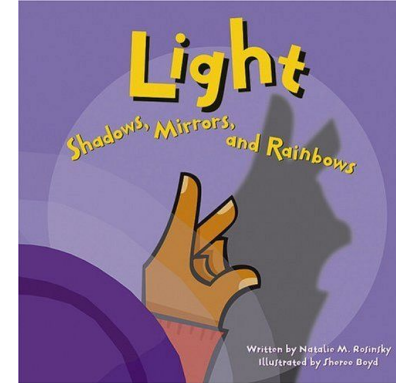
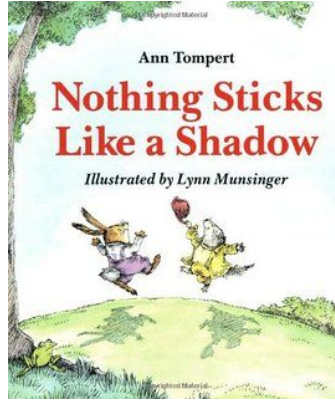
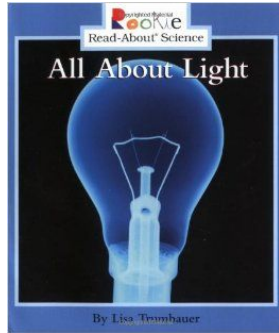


Here are a few suggested books related to sound.
Check your class library, school library, or local library.





Here are a few suggested books related to light.
Check your class library, school library, or local library.



PS4-1 Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.

Clarification Statement: Examples of vibrating materials that make sound could include striking a tuning fork and plucking a stretched string. Examples of how sound can make matter vibrate could include holding a piece of paper near a speaker making sound and holding an object near a vibrating tuning fork.

Sound [Board](#): Click on Board Link to find all Week 1 plans and resources that are listed below.

1. Students complete the [Sound Probe](#) as a Pre-assessment
(intranet password protected) two options: circle pictures or cut & sort
2. **Engage:** *What can you hear?* [Listen to video of sounds.](#)
3. KLEWS chart: Students share out what they know about sound
4. Read a sound related book.

Resources

[Pre-Assessment: Sound Probe](#)

Large KLEWS classroom chart

Books about Sound (see previous literature resources slide)

Vocabulary:

Sound

Ear

Week 2

Explore/Explain

PS4-1 Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.

Clarification Statement: Examples of vibrating materials that make sound could include striking a tuning fork and plucking a stretched string. Examples of how sound can make matter vibrate could include holding a piece of paper near a speaker making sound and holding an object near a vibrating tuning fork.

Instruction

Sound [Board](#): Click on Board Link to find all Week 2 plans and resources that are listed below.

1. **Explore** Vibration: Whole class explore: [Larynx Laughs](#)

Student Explore: (Choose one of the following):

- Rubber band box (*based off the [assessment probe](#)*) see also: [Rubber Band Guitar on PBS learning- Zoom](#) for more background information and ideas
- [Making a Splash/Musical Rulers](#)

2. **Explain:** Discussions and videos from DE [Explore Tab](#)

DE- How are sounds made?

DE- How does movement cause sound?

DE- How do we describe sounds?

DE -Why is sound important?

Read literature related to sound

3. Add to KLEWS chart

Resources

[Larynx Laughs](#)

[Rubber Band Box activity](#) *based on assessment probe*

[Rubber Band Guitar on PBS learning- Zoom](#)

[Making a Splash and Musical Rulers](#)

[BrainPop Jr.- sound video](#)

KLEWS classroom chart

Literature (see Sound books on slide 11)

Vocabulary:

Sound

Ear

Soft

Loud

Quiet

Pitch

Volume

Vocal Chords

Vibrate/vibration

PS4-1 Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.

Clarification Statement: Examples of vibrating materials that make sound could include striking a tuning fork and plucking a stretched string. Examples of how sound can make matter vibrate could include holding a piece of paper near a speaker making sound and holding an object near a vibrating tuning fork.

Instruction

Sound [Board](#): Click on Board Link to find all Week 3 plans and resources that are listed below.

Choose about 5 stations from the suggested list of stations for the students to rotate through throughout the week. After you select your stations, you can create a student station board (using DE) for students to utilize.

Guiding questions to pose for stations either before, during, and/or after stations:

- *What have you noticed about these materials?*
- *How did you make these materials produce a loud/soft/quiet sound?*
- *Which material makes the loudest/softest/quietest sound?*
- *How were the materials the same/different?*
- *What did you do to make these materials make sound?*

Add to the KLEWS chart at the END of the week from all the station experiences

Craft a Scientific explanation together on the last day - use Claim and Evidence statements.

Resources

Below are a variety of sound station activities and lessons you can choose from:

[Sound Stations - NSTA lesson](#)

[Sound Stations - station cards](#)

[Sounds All Around](#) (intranet password protected)

[Pitch - Straw Kazoo](#)

Interactive simulations/games:

[Sound and Hearing](#)

[Changing Sounds](#)

[Online Tuning Fork](#)

[Magic School Bus Gets an Earful](#)

Vocabulary

Sound

Ear

Soft

Loud

Quiet

Pitch

Volume

Vibrate/vibration

PS4-1 Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.

Clarification Statement: Examples of vibrating materials that make sound could include striking a tuning fork and plucking a stretched string. Examples of how sound can make matter vibrate could include holding a piece of paper near a speaker making sound and holding an object near a vibrating tuning fork.

Instruction

Sound [Board](#): Click on Board Link to find all Week 4 plans and resources that are listed below

Explore Sound Waves: Choose one of the following activities for students to explore:

- [Feel the Beat](#) Station Card and Student Recording Page
- [Experiments with Sound: Sound Waves](#)

Explain Sound Waves:

DE [Vibrations and Waves](#) video

Read books about Sound Waves

Sound Poems (see resources column)

Add to KLEWS classroom chart

Resources:

[Feel the Beat](#) Station Card and Student Page

[Experiments with Sound: Sound Waves](#)

Books about Sound Waves

(see literature resources slide 11)

KLEWS classroom chart

[Sound Poems](#) (click link or see next slide)

[The Poetry of Science](#) Teacher Guide from NSTA
Science and Children December 2016

Vocabulary:

Sound waves

Sound

Ear

Soft

Loud

Quiet

Pitch

Volume

Vibrate/vibration

The Vibration Song

Strings vibrate and we hear a song,
Hands move air as we clap along.
Vibrations make buzzes and clicks
and more,
Air and throat can make a roar.
When I need you, I do not yell.
I can clap or ring a bell.
We hear vibrations every day,
Even when we're far away.

Sound Waves

By Michael Salinger

Sound travels in waves
Like ripples from a penny
Dropped in a bucket of water.
Once sound is created
A tick, a tock, a clap, a boom,
A whisper, a crackle, a crash, a zoom.
Its energy rides upon the crest
Doing what any wave does best.
Traveling through air, water, or even a solid until its
energy is finally used up
And the noise fades to quiet
The sound flattened to stillness
Not making a peep
Until that dog next door barks
Setting off another wave
Waking you from your sleep.

PS4-1 Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.

Clarification Statement: Examples of vibrating materials that make sound could include striking a tuning fork and plucking a stretched string. Examples of how sound can make matter vibrate could include holding a piece of paper near a speaker making sound and holding an object near a vibrating tuning fork.

1-PS4-4 Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.*

Clarification Statement: Examples of devices could include a light source to send signals, paper cup and string “telephones”, and a pattern of drum beats.

Assessment Boundary: Assessment does not include technological details for how communication devices work.

Instruction

Sound [Board](#): Click on Board Link to find all Week 5 plans and resources that are listed below.

1. [The Boy Who Used Sound](#) - Sound Engineering Design Challenge
(only complete the sound challenge)
2. Students complete the [Sound Probe](#) as a Post-assessment (intranet password protected) two options: circle pictures or cut & sort

1-PS4-2 Make observations to construct an evidence-based account that objects can be seen only when illuminated.

Clarification Statement: Examples of observations could include those made in a completely dark room, a pinhole box, and a video of a cave explorer with a flashlight. Illumination could be from an external light source or by an object giving off its own light.

1-PS4-3 Plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light.

Clarification Statement: Examples of materials could include those that are transparent (such as clear plastic), translucent (such as wax paper), opaque (such as cardboard), or reflective (such as a mirror).

Assessment Boundary: Assessment does not include the speed of light.

Instruction

[Light Board](#): Click on Board Link to find all Week 6 plans and resources that are listed below.

Engage:

1. Students complete Light Pre-Assessment Probe: [Can It Reflect Light?](#)
(intranet password protected) two options: circle pictures or cut & sort
2. DE: [What Does Light Do?](#)
3. KLEWS chart: Students share out what they know about light
4. Read a Light related book. (see literature slide 12)

Resources

KLEWS large classroom chart
Books about Light (see literature slide 12)
[Light Pre-Assessment Probe](#)

Vocabulary

Light
eye

Week 7

Explore/Explain

1-PS4-2 Make observations to construct an evidence-based account that objects can be seen only when illuminated.

Clarification Statement: Examples of observations could include those made in a completely dark room, a pinhole box, and a video of a cave explorer with a flashlight. Illumination could be from an external light source or by an object giving off its own light.

1-PS4-3 Plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light. Clarification Statement: Examples of materials could include those that are transparent (such as clear plastic), translucent (such as wax paper), opaque (such as cardboard), or reflective (such as a mirror).

Assessment Boundary: Assessment does not include the speed of light.

Instruction

[Light Board](#): Click on Board Link to find all Week 7 plans and resources that are listed below.

Explore: [Mirror Challenge](#)

Explain:

What Are Some Objects That Reflect or Transmit Light?

DE: [Mirrors Reflect Light](#) (reading passage)

How Can Light Be Reflected onto Another Object Using a Mirror?

DE: [Magic School Bus Gets a Bright Idea](#)

Add to classroom KLEWS chart.

Resources

[Mirror Challenge](#)

Vocabulary

light

Reflect

Illuminate

beam

Week 8

Explore/Explain

1-PS4-2 Make observations to construct an evidence-based account that objects can be seen only when illuminated.

Clarification Statement: Examples of observations could include those made in a completely dark room, a pinhole box, and a video of a cave explorer with a flashlight. Illumination could be from an external light source or by an object giving off its own light.

1-PS4-3 Plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light. Clarification Statement: Examples of materials could include those that are transparent (such as clear plastic), translucent (such as wax paper), opaque (such as cardboard), or reflective (such as a mirror).

Assessment Boundary: Assessment does not include the speed of light.

Instruction

[Light Board](#): Click on Board Link to find all Week 8 plans and resources that are listed below.

Explore: [Just Passing Through](#) (*Intranet Password Protected*)

Explain:

What Happens When Light Strikes Different Objects and Materials?

DE: [Paul the Penguin: Light and Light Energy](#)

BrainPop Jr. [Light](#)

Add to classroom KLEWS chart

Resources

[Just Passing Through lesson](#)

Classroom KLEWS chart

[BrainPop Jr. Video- Light](#)

Vocabulary

Reflect

Illuminate

Beam

light

1-PS4-2 Make observations to construct an evidence-based account that objects can be seen only when illuminated.

Clarification Statement: Examples of observations could include those made in a completely dark room, a pinhole box, and a video of a cave explorer with a flashlight. Illumination could be from an external light source or by an object giving off its own light.

1-PS4-3 Plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light.

Clarification Statement: Examples of materials could include those that are transparent (such as clear plastic), translucent (such as wax paper), opaque (such as cardboard), or reflective (such as a mirror).

Assessment Boundary: Assessment does not include the speed of light.

Instruction

[Light Board](#): Click on Board Link to find all Week 9-10 plans and resources that are listed below.

More **Explore**: Choose from the following activities ([intranet password protected page](#)):

- Magnify
- Prism Power If no prism, use the back of a CD
- Light Sources
- Light Rays Slow Down
- DE: [Make Shadow Puppets](#)

Explain: Read Literature

Add to class KLEWS chart

Craft a Scientific explanation together on the last day

Resources

Select from the lessons below (found on [this intranet page](#)):

Magnify

Prism Power

Light Sources

Light Rays Slow Down

Literature about Light (see literature slide 12)

Vocabulary

Reflect

Illuminate

Beam

light

Week 11

Explain/Elaborate/STEM

1-PS4-4 Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.*

Clarification Statement: Examples of devices could include a light source to send signals, paper cup and string “telephones”, and a pattern of drum beats.

Assessment Boundary: Assessment does not include technological details for how communication devices work.

Instruction

[Light Board](#): Click on Board Link to find all Week 9-10 plans and resources that are listed below.

More **Explain** options:

DE Boards (choose from the following):

- [Lights and Mirrors](#)
- [Light lesson 1](#)
- [Light Lesson 2](#)

Elaborate: [The Boy Who Used Light](#) Design Challenge (Light)

Add to class KLEWS chart

Resources

KLEWS chart

[The Boy Who Used Light](#) Design Challenge

Vocabulary

Reflect

Illuminate

Beam

light

Week 12

STEM/Evaluate

1-PS4-4 Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.*

Clarification Statement: Examples of devices could include a light source to send signals, paper cup and string “telephones”, and a pattern of drum beats.

Assessment Boundary: Assessment does not include technological details for how communication devices work.

Instruction

[Light Board](#): Click on Board Link to find all Week 12 plans and resources that are listed below

DE: Elaborate with STEM - [Project Airplane Windows](#)
(this could be as hands-on as you choose to make it)

Students complete Light Post-Assessment Probe: [Can It Reflect Light?](#)
(intranet password protected) two options: circle pictures or cut & sort

Resources

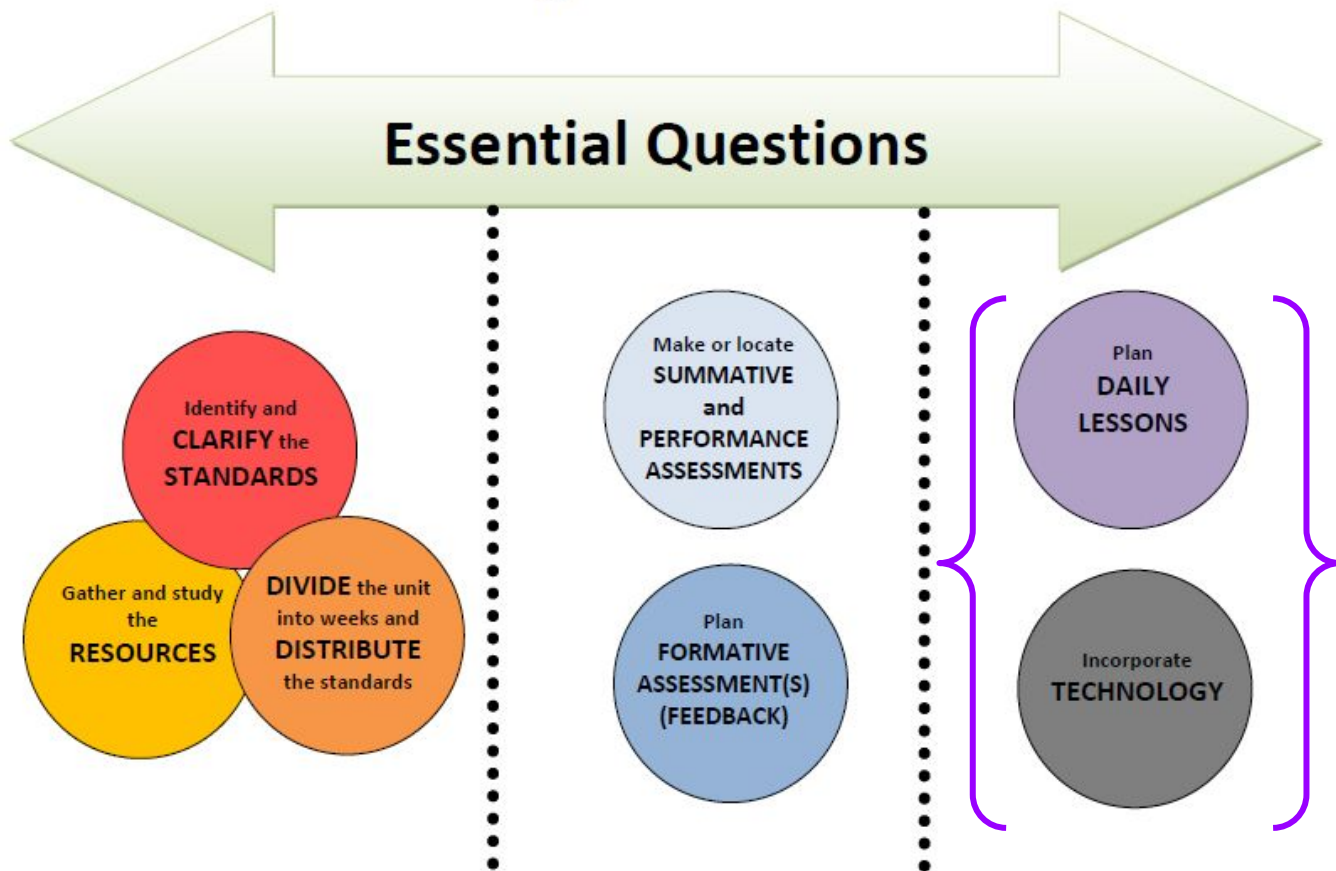
Literature books about light (see literature slide 12)

[Project Airplane Windows](#)

Vocabulary

Reflect
Illuminate
Beam
light

Backward Unit Planning 1.0



Now you're
ready to
plan your
daily
lessons!