

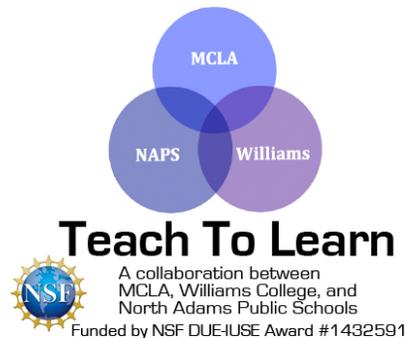
## The Evolution of the T2L Science Curriculum

Over the last four years, the Teach to Learn program created 20 NGSS-aligned science units in grades K-5 during our summer sessions. True to our plan, we piloted the units in North Adams Public Schools, and asked and received feedback from our science fellows and our participating teachers. This feedback served as a starting point for our revisions of the units. During year 2 (Summer of 2015), we revised units from year 1 (Summer/Fall 2014) and created new units to pilot. In year 3, we revised units from years 1 and 2 and created new units of curricula, using the same model for year 4. Our understanding of how to create rich and robust science curriculum grew, so by the summer of 2018, our final summer of curriculum development, we had created five exemplar units and established an exemplar unit template which is available in the T2L Toolkit.

We made a concerted effort to upgrade all the existing units with exemplar components. We were able to do much, but not all. So, as you explore different units, you will notice that some contain all elements of our exemplar units, while others contain only some. The fully realized exemplar units are noted on the cover page. We did revise all 20 units and brought them to a baseline of “exemplar” by including the Lessons-At-A-Glance and Science Talk elements.

Grade 1

# Light and Sound



T2L Curriculum Unit

# Light and Sound

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## Physical Science/Grade 1

In this unit, students will explore the concept of light and sound. In first grade, students begin to identify patterns and use this knowledge to predict future patterns. They will learn that light and sound pass through various materials in different ways and that light and sound can be used to send signals over a distance. (Adapted from NGSS)



## Unit Creation and Revision History

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## UNIT PLAN

| <b>Stage 1 Desired Results</b>  |   |                |  |                       |          |   |  |                                 |  |  |  |
|---|---|----------------|--|-----------------------|----------|---|--|---------------------------------|--|--|--|
| <p><b>1-PS4-1.</b> Demonstrate that vibrating materials can make sound and that sound can make materials vibrate. [Clarification Statement: Examples of vibrating materials that make sound could include tuning forks, a stretched string or rubber band, and a drum head. Examples of how sound can make materials vibrate could include holding a piece of paper near a speaker making sound and holding an object near a vibrating tuning fork.]</p> <p><b>1-PS4-3.</b> Conduct an investigation to determine the effect of placing materials that allow light to pass through them, allow only some light through them, block all the light, or redirect light when put in the path of a beam of light. [Clarification Statement: Effects can include some or all light passing through, creation of a shadow, and redirecting light. Quantitative measures are not expected.]</p> <p><b>1-PS4-4.</b> Use tools and materials to design and build a device that uses light or sound to send a signal 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. Technological</p> | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2" style="background-color: #e0e0e0; text-align: center;"><i>Meaning</i></th> </tr> <tr> <th style="background-color: #e0e0e0; text-align: center;"><b>UNDERSTANDINGS</b></th> <th style="background-color: #e0e0e0; text-align: center;"><b>U</b></th> </tr> </thead> <tbody> <tr> <td style="background-color: #f4a460; padding: 5px;"> <p><i>Students will understand that...</i></p> <ul style="list-style-type: none"> <li>Sound can make matter vibrate, and vibrating matter can make sound. (1-PS4-1)</li> <li>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)</li> <li>People also use a variety of devices to communicate (send and receive information) over long distances. (1-PS4-4)</li> </ul> </td> <td style="background-color: #e0e0e0; text-align: center; vertical-align: top; padding: 5px;"> <b>ESSENTIAL QUESTIONS</b><br/><br/> <b>Q</b> <ol style="list-style-type: none"> <li><b>1. What makes sound?</b></li> <li><b>2. How do light and sound travel?</b></li> <li><b>3. How can we use light and sound to send messages?</b></li> </ol> </td> </tr> <tr> <th colspan="2" style="background-color: #e0e0e0; text-align: center;"><i>Student Learning Targets</i></th> </tr> <tr> <td colspan="2" style="padding: 5px;"> <p><i>Students will be able to:</i><br/>           Science Learning Objectives</p> <ol style="list-style-type: none"> <li>1. Identify pitch and volume of various sound samples</li> <li>2. Record observations of vibrations</li> </ol> </td> </tr> </tbody> </table> | <i>Meaning</i> |  | <b>UNDERSTANDINGS</b> | <b>U</b> | <p><i>Students will understand that...</i></p> <ul style="list-style-type: none"> <li>Sound can make matter vibrate, and vibrating matter can make sound. (1-PS4-1)</li> <li>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)</li> <li>People also use a variety of devices to communicate (send and receive information) over long distances. (1-PS4-4)</li> </ul> | <b>ESSENTIAL QUESTIONS</b><br><br><b>Q</b> <ol style="list-style-type: none"> <li><b>1. What makes sound?</b></li> <li><b>2. How do light and sound travel?</b></li> <li><b>3. How can we use light and sound to send messages?</b></li> </ol> | <i>Student Learning Targets</i> |  | <p><i>Students will be able to:</i><br/>           Science Learning Objectives</p> <ol style="list-style-type: none"> <li>1. Identify pitch and volume of various sound samples</li> <li>2. Record observations of vibrations</li> </ol> |  |
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|  |   |
|--|---|
| <p>details for how communication devices work are not expected.]</p> <p><b>Literacy Standards</b></p> <p><b>1.RI.5</b> Know and use various text features (e.g., headings, tables of contents, glossaries, electronic menus, icons) to locate key facts or information in a text.</p> <p><b>1.RI.6</b> Distinguish between information provided by pictures or other illustrations and information provided by the words in a text.</p>  | <ol style="list-style-type: none"> <li>3. Demonstrate and communicate that vibrations create sound</li> <li>4. Make a model to show that a beam of light moves in a straight line</li> <li>5. Demonstrate that when a beam of light is blocked it creates a shadow that is directly related to the shape of the object creating the shadow</li> <li>6. Demonstrate that light can pass through some objects and not others</li> <li>7. Create a device that uses vibration to transmit a message</li> <li>8. Explain the path of vibrations</li> <li>9. Communicate a message using a light source</li> </ol> <p>Literacy Learning Objectives</p> <ol style="list-style-type: none"> <li>1. Use text features to make predictions before and during reading</li> <li>2. Identify text features in an informational text</li> <li>3. Identify information given in a photograph</li> <li>4. Use headings to make predictions during reading</li> <li>5. Write a sentence that supports the heading</li> <li>6. Draw an illustration that supports the heading</li> <li>7. Write a caption that further explains the photo</li> <li>8. Identify bold face words, headings, and captions in an informational text</li> </ol> |
| <b>Stage 2 – Evidence</b>  |   |
| <b>Evaluative Criteria</b>   | <b>Assessment Evidence</b>  |
| CEPA Rubric (see Lesson 13 materials)  | <p>CEPA: You are stuck on an island and want to signal a passing ship that you need HELP. The signal for help is S O S, which is signaled by . . . _ _ _ . . .</p> <p>You must create a device that uses light or sound to send your SOS signal.</p> <p>OTHER EVIDENCE:</p> <p>Throughout the unit students will complete a variety of assessments to measure their progress toward mastery of the lesson objectives.</p>   |
| <b>Stage 3 – Learning Plan</b>   |   |
| <p><b>Lesson 1: Sensing Light and Sound:</b> This lesson can be integrated into the literacy block or taught in the science block by the classroom teacher. It should be taught in small reading groups to allow for discussion. In order for students to distinguish between fiction and nonfiction they will begin to identify characteristics of a nonfiction text. This lesson will introduce key vocabulary, begin using a KWL chart and text feature anchor chart to start your unit on light and sound.</p> |   |

**Lesson 2: Introduction to Sound and Vibration:** This lesson will introduce the concepts of sound and vibration. This lesson was adapted from the PBS lesson “Sound Vibration”, it is designed to help students understand that vibrations are responsible for the sounds we hear. This lesson will be a collaborative effort between the science fellows and the students, the students will be mimicking the demonstrations done by the science fellows.

**Lesson 3: Vibrations Make Sound:** The lesson should be taught in small groups; it should also be integrated into the literacy block or science block. In order for students to distinguish between fiction and nonfiction they will continue to identify characteristics of a nonfiction text. This lesson will introduce key vocabulary, integrate the vocabulary into your KWL chart and text feature anchor chart, and further identify text features, specifically headings.

**Lesson 4: Visualizing Vibrations:** In this lesson, students will be making observations about vibrations. They will observe different types of vibrations in different stations and write down their findings. The purpose of this lesson is to give the students a better sense of the relationship between sound and vibrations. This lesson has been adapted from Discovery Education.

**Lesson 5: Vibration Creation:** Students will use previous knowledge to make their own musical instruments. The students should be divided into stations for making instruments, there should be an adult at each station. If there are not enough adults to have on at each station, choose an instrument to make as a whole group.

**Lesson 6: Light Investigation:** Students will observe and investigate light using flashlights, lights, and a projector. Students will learn that light moves in a straight line unless blocked and when light is blocked it will create a shadow which is directly related to the shape of the object blocking the light.

**Lesson 7: Playing with Light and Shadows:** The lesson should be integrated into the literacy block or science block; it should be taught in small reading groups. In order for students to distinguish between fiction and nonfiction they will begin to identify characteristics of nonfiction text.

**Lesson 8: Light Interactions:** Students will use a light table to explore transparent, translucent, and opaque materials. They will categorize items from transparent to opaque in order.

**Lesson 9: Light Art:** Students will use the knowledge they've gained about light and materials that block light to make suncatchers with transparent, translucent, and opaque materials.

**Lesson 10: Sending Messages with Light and Sound:** The lesson should be integrated into the literacy block or in the science block. It should be taught in small reading groups. In order for students to distinguish between fiction and nonfiction they will begin to identify characteristics of nonfiction text.

**Lesson 11: Sending Messages- Sound:** In this lesson students will learn that sound comes from a source and travels. Students will engage in an activity that has them to distinguish the source of the sound. This will lead into a discussion about sounds the students hear in school and what sounds are sending the messages ( ex. school bell, teachers use of sounds to get students attention, coach whistles etc). Students will participate in several activities that use sound to send signals, for example paper cup and string "telephones," and a pattern of drum beats".

**Lesson 12: Sending Messages- Light:** Students will build upon their knowledge that light travels in a beam and give examples of how we use light to send signals (light house, street lights). Students will use a specific light source to send signals.

**Lesson 13: Communication Device:** In this lesson, students will work with a partner to construct a communication device using sound or light. Students will be provided with specific materials and will use knowledge from Lessons 11 and 12 to construct their own communication device.

Adapted from Massachusetts Department of Elementary and Secondary Education's Model Curriculum Unit Template. Originally based on Understanding by Design 2.0 © 2011 Grant Wiggins and Jay McTighe. Used with Permission July 2012

# Tiered Vocabulary List

| Tier 1   | Tier 2  | Tier 3  |
|--|---|---|
| Sound<br>Light<br>Guitar<br>Whistle<br>Straight<br>Line<br>Shadow<br>Object<br>Material<br>Form<br>Walkie-talkie<br>Flashlight | Sense<br>Volume<br>Pitch<br>Source<br>Redirect<br>Message<br>Information<br>Distance<br>Communicate<br>Travel<br>Demonstrate<br>Model<br>Signal<br>Device<br>Create<br>Design | Vibration<br>Light beam<br>Opaque<br>Translucent<br>Transparent |

## Lessons at a Glance

|  Independent online student research  Tech Integration  YouTube Video<br> Outdoor education  Kinesthetic Learning |   |            |   |
|--|---|------------|---|
| Lesson   | Core Activities   | Extensions | Aspects of Lesson   |
| 1.Sensing Light and Sound<br><b>(Literacy Lesson)</b>  | <ul style="list-style-type: none"> <li>• Predictions + Book Reading</li> <li>• KWL Chart</li> <li>• Writing Activity</li> </ul> |            |   |
| 2.Introduction to Sound and Vibration  | <ul style="list-style-type: none"> <li>• Kazoo Activity</li> <li>• Pitch Activity</li> </ul>                                    |            |    |
| 3.Vibrations Make Sound<br><b>(Literacy Lesson)</b>  | <ul style="list-style-type: none"> <li>• Prediction + Book Reading</li> <li>• KWL Chart</li> <li>• Writing Activity</li> </ul>  |            |   |
| 4. Visualizing Vibrations  | <ul style="list-style-type: none"> <li>• Activator</li> <li>• Stations</li> </ul>   |            |    |

|   |  |  |   |
|---|--|--|---|
| 5. Vibration Creation   | <ul style="list-style-type: none"> <li>• Activator</li> <li>• Stations</li> </ul>  |  |    |
| 6. Light Investigation  | <ul style="list-style-type: none"> <li>• Book + Review of Book</li> <li>• Light and Shadow Activity</li> </ul>                 | <ul style="list-style-type: none"> <li>• Students can draw a person, the sun, and the person's shadow in their science journal</li> </ul>                                      |    |
| 7. Playing with Light and Shadows<br><b>(Literacy Lesson)</b>         | <ul style="list-style-type: none"> <li>• Prediction + Book Reading</li> <li>• KWL Chart</li> <li>• Writing Activity</li> </ul> |  |   |
| 8. Light Interactions   | <ul style="list-style-type: none"> <li>• Transparency Activity</li> <li>• Group Investigation</li> </ul>                       |  |   |
| 9. Light Art  | <ul style="list-style-type: none"> <li>• Suncatcher Activity</li> </ul>  |  |    |
| 10. Sending Messages with Light and Sound<br><b>(Literacy Lesson)</b> | <ul style="list-style-type: none"> <li>• Prediction + Book Reading</li> </ul>  |  |   |
| 11. Sending Messages: Sound   | <ul style="list-style-type: none"> <li>• Walkie-Talkie Activity</li> </ul>   | <ul style="list-style-type: none"> <li>• Allow the students to construct more walkie-talkies with differing lengths of string, or different types of cups or string</li> </ul> |  |
| 12. Sending Messages: Light   | <ul style="list-style-type: none"> <li>• Flashlight Activity</li> </ul>  |  |   |
| 13. Communication Device  | <ul style="list-style-type: none"> <li>• Communication Device</li> </ul>   |  |  |

# Lesson Feature Key

Lessons in this unit include a number of features to help instructors. This key is a quick guide to help identify and understand the most important features.

## Icons



**Talk science icon:** Look for this icon to let you know when to use some of the talk science strategies (found in the unit resources of this unit)



**Anchor phenomenon icon:** Indicates a time when an anchoring scientific phenomenon is introduced or when an activity connects back to this important idea.

### Text Formatting:

[SP#: ...] Any time you see a set of brackets like this, it indicates that students should be engaged in a specific science or engineering practice.

### Underlined text in the lesson:

This formatting indicates important connections back to the central scientific concepts, and is useful to note these connections as an instructor, as well as for students.

## Callouts

### Teaching Tip

In these call out boxes, you'll find tips for teaching strategies or background information on the topic.

### Student Thinking Alert

Look out for common student answers, ways in which students may think about a phenomenon, or typical misconceptions.

# Lesson 1: “Sensing Light and Sound”

## (Literacy Lesson) *Taught by Classroom Teacher*

### BACKGROUND

Comprehending informational text is essential to conducting research. An important skill to research is locating key information efficiently. The following lessons focus on identifying text features which will build a basis for conducting research later in the year or in later grades. Throughout first grade, students are developing their understanding of genre and the differences between fiction and nonfiction. The four literacy lessons will provide students with the opportunity to use text features to make predictions and develop an understanding of craft and structure. The literacy lessons should be taught by the classroom teachers in small reading groups.

### Overview of the Lesson

This lesson can be integrated into the literacy block or taught in the science block by the classroom teacher. It should be taught in small reading groups to allow for discussion. In order for students to distinguish between fiction and nonfiction they will begin to identify characteristics of a nonfiction text. This lesson will introduce key vocabulary, begin using a KWL chart and text feature anchor chart to start your unit on light and sound.

### Focus Standard(s)

- 1.RI.5** Know and use various text features (e.g., headings, tables of contents, glossaries, electronic menus, icons) to locate key facts or information in a text.
- 1.RI.6** Distinguish between information provided by pictures or other illustrations and information provided by the words in a text.

## Learning Targets

1. I can use text features to make predictions before and during reading.
2. I can identify text features in an informational text.
3. I can identify information given in a photograph.

## Assessment(s)

- Photograph Sentence writing assignment worksheet (independent)
- Count the features tally chart on the worksheet (partner)

## WIDA Language Objectives

(Dependent on the needs of your ELL students)

## Targeted Academic Language/Key Vocabulary

**Tier 1:** sound, light

**Tier 2:** sense, vibration

## RESOURCES AND MATERIALS

| Quantity        | Item  | Source            |
|-----------------|---|-------------------|
| <b>8 copies</b> | <b>Book : “Sensing Light and Sound” by Jennifer Boothroyd</b> | <b>Bin</b>        |
| 2               | Large chart paper   | Classroom Teacher |
| 1               | Marker  | Classroom Teacher |
| 1               | Family photograph   | Classroom Teacher |
| 1               | Worksheet 1   | Binder            |
| 1               | Tally Chart   | Binder            |

**\*\*Items in bold should be returned for use next year\*\***

## LESSON DETAILS

### Lesson Opening/ Activator

**\*\*Text features include all the components of a story or article that are not the main body of text. These include the table of contents, index, glossary, headings, bold words, sidebars, pictures and captions, and labeled diagrams. These features can be helpful if they are concise, related to the content, and clear, or they can be harmful if they are poorly organized, only loosely related to the content, or too wordy.\*\*** (source: <http://www.readingrockets.org/article/guiding-students-through-expository-text-text-feature-walks>)

Bring in a photo of your family. Explain to students that photographs can give you more information. Tell students that this is a photograph of your family. What other information does this photo show? (For example, how many members you have, if you have a pet dog etc.) Tell students “Now you have more information about me because of a photograph.” Explain that there are others ways to get information from a book besides the words we read, a photograph is one of them, which is an example of a text feature. Write “Text Features” on a chart paper, then write photograph on the left side and attach your photo to the right side, you will be adding more text features as the lessons progress.

### During the Lesson

1. **Prediction:** Show the students the book, “Sensing Light and Sound” then read the title and show the cover photo. Ask the students what they think the book is about. Do you think this is fiction or nonfiction? Explain that nonfiction books can teach us or give us information...one clue is there may be real photographs and other text features. Now use think aloud strategy to demonstrate how you would use the photos, and headings to inform the predictions the students made. For example, turn the pages as you would for a picture walk in a narrative text and discuss how the photograph may be connected to the title or to the topic of light and sound. For instance, “When I cover the main text on this page I see these big words (a heading) that says “Seeing Light” and I see a photograph of eyes, I predict this part of the book will teach me about how our eyes see light”.

- KWL:** Begin filling out the ‘K’ section of a KWL chart titled: Light and Sound. Brainstorm what students already know about the topic and record responses in the ‘K’ column. Have students turn and talk with another student about some *questions* they have about sound and light. Discuss responses and record in the ‘W’. Tell students they will find out answers to their questions in this unit from reading books, making observations, and conducting investigations. *Keep this KWL in the classroom so it can be used with future lessons.*
- Read:** After you have activated prior knowledge and set a purpose for reading using the KWL chart, read the book together with students. On page 4, you will encounter your first boldface word. Explain to students that these words look different because they are usually words we might not know the meaning of. Add this to your text feature chart with the image. Be sure to show students the glossary and definitions. Add glossary to your text feature chart with the image. *Note: “Headings” will be added in the next lesson.*

Stop on page 6 and discuss how the photograph reinforces what the author is saying in the main text. For example, “It shows how the boys are using their sense of touch to experience what the animal feels like, their sense of sight to see what the animal looks like/or how it acts, and their sense of hearing to listen to the sounds it makes”. Stop on page 14 and 21 and ask students why the author chose that photograph? What does the photograph tell us about sound or light?

- Writing:** Students will need Worksheet 1, the Tally Chart, and the book. Tell students to open to page 19, it says ‘You can feel sound vibrations’, the glossary told us that, ‘vibration is a back and forth movement’. What is this photograph telling us about feeling vibrations?”. Let’s fill in the blank on our worksheet. Read the sentence starter on the worksheet and let them fill in the blank. Allow students to work in partners to complete the text feature tally chart. Have students turn through each page of the book and identify the text features listed in the Tally Chart. Students will mark 1 tally each time they find a text feature.

## Lesson Closing

Tell students that this nonfiction book teaches us about light and sound. Turn and talk with another student and share one thing you learned from the book, you can add any comments to the KWL chart.

## Assessment(s)

- Photograph Sentence writing assignment worksheet (independent)
- Count the features tally chart on the worksheet (partner)

# Lesson 2: Introduction to Sound and Vibration



## BACKGROUND

### Overview of the Lesson

This lesson will introduce the concepts of sound and vibration. This lesson was adapted from the PBS lesson “Sound Vibration”, it is designed to help students understand that vibrations are responsible for the sounds we hear. This lesson will be a collaborative effort between the science fellows and the students, the students will be mimicking the demonstrations done by the science fellows.

*Note: Parts of this lesson should be prepared ahead of time. These parts will be indicated throughout the lesson plan.*

### Focus Standard

**1-PS4-1.** Demonstrate that vibrating materials can make sound and that sound can make materials vibrate. [Clarification Statement: Examples of vibrating materials that make sound could include tuning forks, a stretched string or rubber band, and a drum head. Examples of how sound can make materials vibrate could include holding a piece of paper near a speaker making sound and holding an object near a vibrating tuning fork.]

### Learning Targets

1. I can communicate that vibrations make sound
2. I can identify relative pitch and volume of various sounds

### Assessment(s)

- KWL chart (group)
- Pitch and Volume worksheet (individual)

## Targeted Academic Language/Key Vocabulary

**Tier 1:** sound

**Tier 3:** vibration, volume, pitch

## RESOURCES AND MATERIALS

| Quantity     | Item                       | Source  |
|--------------|----------------------------|---|
| As available | Musical Instruments        | Music Teacher/ Classroom Teacher/Science Fellow |
| 25           | Plastic straws             | Bin   |
| Class set    | Scissors                   | Classroom Teacher                               |
| 1 per child  | Pitch and Volume Worksheet | Binder  |
| 20           | Plastic Kazoos             | Bin   |

**\*\*Items in bold should be returned for use next year\*\***

## LESSON DETAILS

### Lesson Opening/ Activator

Use this lesson activator to get the students excited for the lesson. There are many different ways in which the science fellows can begin this lesson. In collaboration with the music instructor, the science fellows can use instruments and play them for the students to introduce them to the concept of sound. The science fellows can also play music from a computer or even sing to the students.

KWL chart: As a pre-assessment tool, and to activate prior knowledge, ask students: “How do you think sounds are made?” Use the information to fill in the “K” section of the KWL chart. Then as a class talk about what it is you want to learn about sound, and fill out the “W” section.

## During the Lesson

1. Demonstrate vibrations by blowing air through your lips (ie: blowing a raspberry). Ask students what is happening with your lips to make that sound. Introduce the word *vibration* and define it: a rapid back-and-forth movement (Note: demonstrate that rapid means fast). Have students mimic the act of vibration by rocking back and forth. Tell the students that they will explore what happens when materials vibrate and what causes it.
2. Ask students to think of other things that vibrate (washing machines, toys, cell phone, car engines, and so on). Share with students that vibrations are what make the sounds. When an object vibrates (moves back and forth), it makes the air around it vibrate. When the air vibrates fast enough you may hear this movement as sound.
3. Make sure the students understand that sound comes in different forms. Ask the students if they know what pitch means. Introduce the concept of pitch to the students and how it relates to size. Unlike a baseball pitch (which is probably the kind of pitch they are more familiar with) this kind of pitch is different even though the word is the same. Play examples of high and low pitch sounds from your computer or use your voice so the students can hear the difference.

Tell the students that alongside pitch, sounds have different volumes. Demonstrate, with your voice, the difference between a loud and soft sound.

4. Now tell the students they will make sounds with vibrations. They will be using straws to create a kazoo and make sounds. **[SP-2 Developing and Using Models]**
5. **The science fellows should prepare the next part of this lesson ahead of time.** It helps to do the lesson ahead of time for practice so you are better able to help the students create sound. The science fellows should also demonstrate how to make the kazoo before the students do it on their own and should have either a pre-made “kazoo” or a picture available to the students as reference.
  - a. Grab a straw and flatten one end of it.

- b. Cut the flattened end to make a V shape.
- c. Open the flattened part of the straw a little bit.
- d. Put the V in your mouth and blow.
- e. An instructional video for how to do this lesson can be found here:  
<http://www.pbslearningmedia.org/resource/phy03.sci.phys.howmove.zkazoo/pitch-straw-kazoo/>
- f. Once students are able to make a sound with their kazoo, ask them what they think will happen if they make the kazoo shorter? After predicting, have them cut down their kazoos (maybe with one partner leaving it longer so they can compare the pitch).

### Sentence Frames:

The sound will be louder/softer.

It will be easier/harder to make sound.



### Science Talk: Whole Group Discussion

6. Ask students if they can feel the vibrations on their lips as they play the kazoo and the sound it produces. Then ask them to think of words that describe the vibrations. After the activity, have the students put away their new “kazoo” before you begin the discussion process. Now gather the students and ask them questions about the investigation and what it is they learned from it.

### Probing Questions:

What did you feel as you blew air into your kazoo?

Did different amounts of blowing make different noises?

What did we learn about vibration through the kazoos?

*If this activity is too difficult, we have provided pre-made plastic kazoos in the bins for students to use instead of the plastic straws\*\**

**Optional: Teachers are encouraged to bring students outside to demonstrate how their kazoos work and for discussion (weather permitting).**

**The science fellows should set up six examples to show low pitch, high pitch, low volume, and high volume.** Play the sounds from instruments or a computer and have students complete the high pitch/low pitch, high volume/low volume worksheet. Be sure to do one example from the worksheet together so the students will know how to fill it out.



Finish up the lesson by filling out the “L” (Learned) section of the KWL chart.

### Assessment(s)

- KWL chart (group)
- Pitch and Volume worksheet (individual)



# Lesson 3: “Vibrations Make Sound”

## (Literacy Lesson) *Taught by the Classroom Teacher*

### BACKGROUND

#### Overview of the Lesson

The lesson should be taught in small groups; it should also be integrated into the literacy block or science block. In order for students to distinguish between fiction and nonfiction they will continue to identify characteristics of a nonfiction text. This lesson will introduce key vocabulary, integrate the vocabulary into your KWL chart and text feature anchor chart, and further identify text features, specifically headings.

#### Focus Standard

**1.RI.5** Know and use various text features (e.g., headings, tables of contents, glossaries, electronic menus, icons) to locate key facts or information in a text.

#### Learning Targets

1. I can use headings to make predictions during reading.
2. I can write a sentence that supports the heading.
3. I can draw an illustration that supports the heading.

#### Assessment

Write and draw a picture of a way to make sound that is different from those in the book - Worksheet 2 - See Step 4 in “During the Lesson” above.

#### WIDA Language Objectives

(Dependent on the needs of your ELL students)

## Targeted Academic Language/Key Vocabulary

Tier 1: guitar, whistle

Tier 3: vibrate, vibration



## RESOURCES AND MATERIALS

| Quantity        | Item   | Source            |
|-----------------|--|-------------------|
| <b>8 copies</b> | <b>Book : “Vibrations Make Sound”</b>                        | <b>Bin</b>        |
| 2               | Large chart paper (text feature chart and KWL from Lesson 1) | Classroom Teacher |
| 1               | Marker   | Classroom Teacher |
| <b>1 set</b>    | <b>Color images of road signs</b>                            | <b>Bin</b>        |
| 1               | Worksheet 2  | Binder            |

**\*\*Items in bold should be returned for use next year\*\***

## LESSON DETAILS

### Lesson Opening/ Activator

Show the students images of road signs. Tell them that when we drive there are signs that tell us what is coming up ahead. Discuss the road signs and connect this to learning about headings. Tell students that just like these road signs communicate what is coming next on the road, a book has a special “text feature” to let readers know what they will be learning about next in a book. Tell students that this is called the heading. Write heading on the text feature chart.

### During the Lesson

1. **Prediction:** Pass out “Vibrations Make Sound” then read the title and show the students the cover photo and ask them to make a prediction of what the book is about. Do you think this is fiction or nonfiction? Review the difference between the two. Do you see an illustration or a photograph? Once they predict the book is nonfiction ask, “What other clues do you think we will find to confirm this is nonfiction? (refer to text feature chart) Students will look at the chart to remember bold face words and a glossary. Now begin the text feature walk. Using the think aloud strategy as in lesson 1 to demonstrate how you would use the photos and headings to inform your prediction.

- KWL** After making a prediction, ask students to remember what they learned about sounds in the last lesson. Is there anything they can add to the 'L' in the chart? Have students turn and talk with a partner. Depending on student responses add to the appropriate part of the KWL chart (learned or want to know). Tell students they will find out answers to their questions from reading books, making observations, and conducting investigations.
- Read:** After you have activated prior knowledge and set a purpose for reading, read the book together with students. When you are on page 4 add the image for headings to your text feature chart. As you read pages 4-10 discuss how the main text answers the question 'What is Sound'. As you read pages 11-15 discuss how the main text answers the question in the heading, 'What makes Sound' etc. If students get confused between captions and headings, explain that the heading tells what the main text will be teaching us and the caption only describes the photograph. Also, point out the size of the heading is usually bigger and a caption is usually placed on a photo or right next to a photo.
- Write:** Before students are told to write on their own, have a group discussion using the sentence starter "Another way I can make a sound is \_\_\_\_", have students give suggestions in a group setting before having them write on their own. Students will need Worksheet 2 and the book. Tell students to open to page 16 and complete writing prompt "Imagine you are adding a new page to the book, the heading is 'How Can You Make Sound'. Write a sentence that tells another way you can make sound that is not listed in the book. Remind students of ways they made sounds with their science fellows to help with ideas. Then have them draw a picture to go with their sentence.

## Lesson Closing

Turn and talk about the essential question "What makes sound?". Refer to KWL chart and add what students have learned about sound.

## Assessment

Write and draw a picture of a way to make sound that is different from those in the book - Worksheet 2 - See Step 4 in "During the Lesson" above.

# Lesson 4: Visualizing Vibrations

## BACKGROUND

### Overview of the Lesson

In this lesson, students will be making observations about vibrations. They will observe different types of vibrations in different stations and write down their findings. The purpose of this lesson is to give the students a better sense of the relationship between sound and vibrations. This lesson has been adapted from Discovery Education.

### Focus Standard

**1-PS4-1.** Demonstrate that vibrating materials can make sound and that sound can make materials vibrate. [Clarification Statement: Examples of vibrating materials that make sound could include tuning forks, a stretched string or rubber band, and a drum head. Examples of how sound can make materials vibrate could include holding a piece of paper near a speaker making sound and holding an object near a vibrating tuning fork.]

### Learning Targets

1. I can record observations of vibrations.
2. I can communicate the idea that sound is vibrations.

### Assessment(s)

Students will record their station observations in their science journals:

- What do you see?
- What do you hear?
- What is making the sound? (This should refer to the vibration not the object)

### WIDA Language Objectives

(Dependent on the needs of your ELL students)

## Targeted Academic Language/Key Vocabulary

**Tier 1:** sound

**Tier 2:** source

**Tier 3:** vibration

## RESOURCES AND MATERIALS

| Quantity      | Item  | Source                          |
|---------------|---|---------------------------------|
| 2-3           | Drums   | Music Teacher/Classroom Teacher |
| <b>1</b>      | <b>Small bag of rice</b>  | <b>Bin</b>                      |
| <b>1</b>      | <b>Tuning Fork</b>  | <b>Bin</b>                      |
| <b>1</b>      | <b>Bowl for water</b>   | <b>Bin</b>                      |
| <b>20</b>     | <b>Popsicle sticks</b>  | <b>Bin</b>                      |
| <b>10</b>     | <b>Rubber bands</b>   | <b>Bin</b>                      |
| <b>3 sets</b> | <b>Metal fork and spoon</b>   | <b>Bin</b>                      |
| 4             | Rulers  | Classroom Teacher               |
| 1/child       | “Visualizing Vibrations” Worksheet  | Binder                          |
| 1 per student | Science Journal   | Classroom Teacher               |
| 1             | Projector for videos  | Classroom Teacher               |
|               | <a href="https://www.youtube.com/watch?v=ZxYmPAEW840">https://www.youtube.com/watch?v=ZxYmPAEW840</a> | CMC Website                     |
|               | <a href="https://www.youtube.com/watch?v=ekRXkSe0G7M">https://www.youtube.com/watch?v=ekRXkSe0G7M</a> | CMC Website                     |

**\*\*Items in bold should be returned for use next year\*\***

## LESSON DETAILS

### Lesson Opening/ Activator

Begin the lesson with this video: <https://www.youtube.com/watch?v=ZxYmPAEW840>. Ask the students what they in the video was familiar to them. Tell the students that they will be observing some vibrations of their own just like the kids in the video **[SP-3 Planning and carrying out investigations]**. Explain to students that they will not be using special glasses like they did in the cartoon, but will be using their senses to observe.

### During the Lesson

*This lesson will utilize stations, be sure to prepare them in advance.*



#### Science Talk: Small Group Discussion

1. Divide the students into groups of 3-4 (this number can change as long as there are 6 groups). Tell each group they will start at one station and rotate through the others. Give each student a “Visualizing Vibrations” worksheet. **Decide how to position the adults in the room to support this activity. [SP- 2 Developing and using models]**
2. Ask the students to **write or draw** what they see, what they hear, and what the source of the sound is (what makes the sound) at each station. The science fellow or classroom teacher will need to model what that this looks like.
3. The stations
  - a. **Station 1:** Drum with rice on the top
    - i. This can be made with wrapping paper (or Saran Wrap) over a coffee can if no a real drum is available
    - ii. Students should tap on the drum and observe what happens to the rice
  - b. **Station 2:** Tuning fork in water
    - i. Gently strike the tuning fork and then place it in the water
  - c. **Station 3:** Touch side of throat and say ahh
    - i. Have students place a finger on their throat and say “ahhhh”
  - d. **Station 4:** Rubber band vibration
    - i. Have two students hold popsicle sticks and connect them with a rubber band

- ii. Have another student pluck the rubber band
  - e. **Station 5:** Fork vibration
    - i. Strike a fork with another utensil and bring it close to the ear
  - f. **Station 6:** Yardstick/Ruler vibration
    - i. Place a ruler at the edge of a desk
    - ii. Hold one end of the ruler firmly against the table
    - iii. Strike the other end that is hanging off the side of the table
4. Allow 5 to 10 minutes for each station and make sure students complete their observations/recordings.
5. After everyone has experienced each station, have each group present about a station to the rest of the class. Each group should share the group's findings with the class. **[SP- 8 Obtaining, Evaluating, and Communicating Information]**

**Sentence Frames:**

At my station I saw \_\_\_\_.

The vibration made the \*object name\* do \_\_\_\_.

I think the \_\_\_\_ moved because \_\_\_\_.

## Lesson Closing

Play this Blue Man video for the students <https://www.youtube.com/watch?v=ekRXkSe0G7M>. Ask them what they observed and how the video ties into what they just learned about vibrations making sound and sound making vibrations that make things move.

## Assessment(s)

Students will record their station observations in their science journals:

- What do you see?
- What do you hear?
- What is making the sound? (This should refer to the vibration not the object)

# Lesson 5: Vibration Creation

## BACKGROUND

### Overview of the Lesson

Students will use previous knowledge about sound and vibrations to make their own musical instruments.

**[SP-2 Developing and using models].** Divide the students into stations for making instruments, there should be an adult at each station. If there are not enough adults to have on at each station, choose an instrument to make as a whole group.

### Focus Standard

**1-PS4-1.** Demonstrate that vibrating materials can make sound and that sound can make materials vibrate. [Clarification Statement: Examples of vibrating materials that make sound could include tuning forks, a stretched string or rubber band, and a drum head. Examples of how sound can make materials vibrate could include holding a piece of paper near a speaker making sound and holding an object near a vibrating tuning fork.]

### Learning Target

I can demonstrate that vibrations make sound.

### Assessment(s)

- Students will use their knowledge of sound and vibration to create their own instrument and make sounds
- Students will describe (orally) how their instrument makes a sound (i.e. what is vibrating to make the sound)

### WIDA Language Objectives

(Dependent on the needs of your ELL students)

## Targeted Academic Language/Key Vocabulary

Tier 1: sound

Tier 2: vibration, volume



## RESOURCES AND MATERIALS

| Quantity             | Item  | Source                     |
|----------------------|---|----------------------------|
| <b>Samples</b>       | <b>Homemade musical instruments</b>   | <b>Science Fellows/Bin</b> |
| 2-3                  | Staplers  | Classroom Teacher          |
| Enough for the class | Crayons   | Classroom Teacher          |
| <b>10</b>            | <b>Any cylindrical container with a top</b>   | <b>Bin</b>                 |
| 2 per child          | Pencils   | Classroom Teacher          |
| 1 pack               | Construction paper  | Bin                        |
| <b>10</b>            | <b>Small boxes with or without lids</b>   | <b>Bin</b>                 |
| <b>1 bag</b>         | <b>Rubber bands of assorted sizes</b>   | <b>Bin</b>                 |
| <b>1 bag</b>         | <b>Dried beans</b>  | <b>Bin</b>                 |
| <b>1 roll</b>        | <b>Plastic Wrap</b>   | <b>Bin</b>                 |
| A few                | Rulers  | Classroom Teacher          |
| <b>5 rolls</b>       | <b>Masking tape</b>   | <b>Bin</b>                 |
| 1                    | Projector   | Classroom Teacher          |
| Assorted             | Classroom materials suitable for project  | Classroom Teacher          |
|                      | <a href="https://www.youtube.com/watch?v=INqfM1kdfUc">https://www.youtube.com/watch?v=INqfM1kdfUc</a> | CMC website                |

**\*\*Items in bold should be returned for use next year\*\***

## LESSON DETAILS

### Lesson Opening/Activator

Play video of a guitar: <https://www.youtube.com/watch?v=INqfM1kdfUc>. Show the students some samples of musical instruments. **(The science fellow and or classroom teacher should make a few sample musical instruments ahead of time)**. Allow the students to shake them, strum them, hit them, to make vibrations and noise. Ask students what they feel when the instruments are making noise (vibrations). Why is the instrument vibrating?

### During the Lesson

*This lesson will utilize stations, be sure to prepare them in advance.*

1. Divide the classroom into three stations. Each stations will get an assortment of materials and a teacher to guide the students.
2. Evenly distribute the shoe boxes, cylindrical containers, rulers, marbles, rubber bands, and pencils amongst the three stations.
3. Tell the students that they will use the materials at each station to create their own instrument. Tell the students that there are only a limited number of items at each station so it is very important to share and work with each other to successfully create instruments. Emphasize that not everyone is going to make the same instrument nor use the same materials and that is ok. The teachers can decide how they want the students to use the materials. The teacher can either have students choose materials one at a time or in an appropriate and safe fashion, choose materials at the same time.



### Science Talk: Small Group Discussion

4. While at the stations
  - a. The teachers should periodically make suggestions to help the students create their instruments.

- b. Remind the students that there are many ways they can make sound through instruments
  - c. Review the different ways sound is made with instruments as they vibrate: via plucking, strumming, hitting, shaking, blowing, etc.
  - d. If students are having difficulty creating an instrument, help them brainstorm ideas.  
Probing Questions:  
What kind of noise do we want to make?  
What instruments have we seen that are similar to the things on the table?  
What instruments have we seen that make vibrations?
  - e. The different instruments that can be made with these materials include (but are not limited to) a drum, a guitar, and a pseudo-tambourine (maracas) (place the marbles in a can and shake it). Make sure students know the name of the instrument they've created, especially if that student will be selected to present.
  - f. Once the students have completed their instruments, choose one student from each group to present their instrument in front of the class and play their instrument.
5. After the activity, begin a discussion about sound and vibrations.
- a. Ask the students about the instruments they made and what their thought process was and if they encountered any difficulties.
  - b. Using the new vocabulary words, they've been learning, ask the students to give a description of the sound their instrument made.

## Lesson Closing

Give students time to play with their instruments and to play with each other's instruments. Have them make noise and have them feel for the vibrations.

## Assessment(s)

- Students will use their knowledge of sound and vibration to create their own instrument and make sounds
- Students will describe (orally) how their instrument makes a sound (i.e. what is vibrating to make the sound)

# Lesson 6: Light Investigation

## BACKGROUND

### Overview of the Lesson

Students will observe and investigate light using flashlights, lights, and a projector. Students will learn that light moves in a straight line unless blocked and when light is blocked it will create a shadow which is directly related to the shape of the object blocking the light.

### Focus Standard

**1-PS4-3.** Conduct an investigation to determine the effect of placing materials that allow light to pass through them, allow only some light through them, block all the light, or redirect light when put in the path of a beam of light. [Clarification Statement: Effects can include some or all light passing through, creation of a shadow, and redirecting light. Quantitative measures are not expected.]

### Learning Targets

1. I can make a model to show that a beam of light moves in a straight line.
2. I can make a model to show that some material can redirect a beam of light.
3. I can demonstrate that when a beam of light is blocked it creates a shadow that is directly related to the shape of the object creating the shadow.

### Assessment(s)

- Students will complete “Using A Periscope” worksheet (assesses students’ knowledge on what a shadow will look like)
- Students will complete “Block the Light” Worksheet (Worksheets can be pasted into science journals or used in addition to the journal).
- **OPTIONAL:** You may also ask students to draw a person, a sun, and the shadow in their science journal

## WIDA Language Objectives

(Dependent on the needs of your ELL students)

## Targeted Academic Language/Key Vocabulary

**Tier 1:** light, straight, line, shadow

**Tier 2:** object, source, redirect

**Tier 3:** light beam

## RESOURCES AND MATERIALS

| Quantity       | Item   | Source            |
|----------------|--|-------------------|
| 1              | <b>Book: Bear Shadow by Frank Asch</b>   | <b>Bin</b>        |
| <b>1</b>       | <b>Plastic Bin</b>   | <b>Bin</b>        |
| 1              | Small carton of milk from cafeteria  | Classroom Teacher |
| <b>12</b>      | <b>Small flashlights - check batteries prior to use</b>  | <b>Bin</b>        |
| <b>12 sets</b> | <b>3 Index cards with holes punched in middle</b>  | <b>Bin</b>        |
| <b>1</b>       | <b>Lump of clay (enough to make stands for the index cards)</b>  | <b>Bin</b>        |
| <b>12</b>      | <b>Safety mirrors</b>  | <b>Bin</b>        |
| <b>12</b>      | <b>Index cards</b>   | <b>Bin</b>        |
| 1/child        | Science journals   | Classroom Teacher |
| 1              | Projector  | Classroom Teacher |
| <b>1</b>       | <b>Bag of objects to try shadows with - some should be patterned<br/>- wooden or plastic toys &amp; blocks</b> | <b>Bin</b>        |
| 1              | "Using A Periscope" worksheet per student  | Binder            |
| 1              | "Block the Light" worksheet per student  | Binder            |

**\*\*Items in bold should be returned for use next year\*\***

## LESSON DETAILS

### Lesson Opening/ Activator

1. Tell the students you will be reading “Bear Shadow” by Frank Asch. Show them the front cover and ask them, “Do they think this book is nonfiction or fiction? If students are unsure, remind them what they learned about photos. “Does this book look like it has a drawing/illustration showing something made-up or a photograph showing something real. Once students conclude that it is fiction, point out that they probably *won't* find bold face words, or headings in this book.
2. Activate knowledge: “This book is called Bear Shadow”, ask students “What are shadows?” When do you have a shadow?
3. Make predictions: “What do you think Bear’s problem or wish will be?”
4. Read Aloud - Ask guiding questions during the read aloud. “What scared the fish away?” “What is making Bear’s shadow?” What does Bear want?” (problem/wish)” Why can’t Bear see his shadow when he is standing behind a tree?” “What will happen if Bear steps out from behind the tree?” “Do you think digging a hole will work?” “Why isn’t the shadow scaring away the fish?” Tell the students that today, they will investigate light and shadows with your science teachers.

### Reviewing Book: Led by Science Fellows

Review and discuss “Bear Shadow”, if it was not read just prior to the lesson

- Where did the Bear’s shadow come from?
- Was he able to get rid of his shadow?

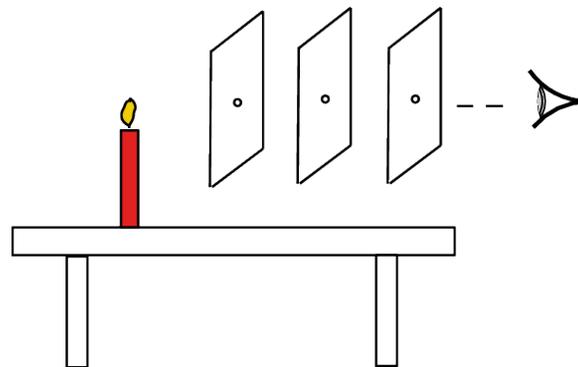
Take a few moments to allow students to create shadow puppets in front of the light board as an activator for the lesson.



## During the Lesson

This lesson will be divided into two sections. The first half will show students that light travels in a straight line, and the second half will have the students investigate shadows.

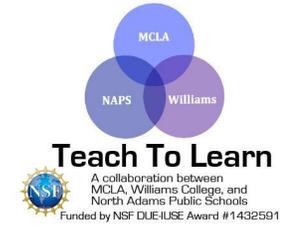
1. Students will participate in a demonstration using the plastic bin of milky water and a flashlight. Students will diagram the light beam in their science journals.
2. Setup: Fill the plastic bin  $\frac{3}{4}$  full with water then add one carton of milk. Give a few students flashlights to point into the plastic bin to see how the beams move in a straight line. (this will work better closer to the side of the plastic bin). It is encouraged to let all the students have a chance to shine the light through the liquid.
3. Now lead the students through a second investigation to show that light moves in a straight line using 3 index cards with a hole punched in the middle, clay, and a flashlight.



**Note: The candle should be replaced with a flashlight.**

4. It is encouraged to have the science fellows demonstrate this activity before sending the groups off to investigate on their own. Divide the students into groups of 2-3 and give each group 3 index cards with holes in them, a flashlight, and a ball of clay. The student's task is to get the light to shine through all three cards. Have students see what happens when they put one card, then two, then three between the flashlight and their partner/group mates. The goal is to get the light to shine through all the cards.
  
5. Ask students what they observed. What happened with the holes were not lined up exactly? Was the light able to bend around to find the hole in each card? What does this tell you about how light travels?
  
6. Explain that we just saw that light could pass through the index cards if the holes were all lined up. Ask students what happens to the light if they shine it at an index card without any holes. Darken the room and have them try it. Now ask them to predict what will happen if they shine the flashlight at a mirror. Have them shine the flashlight right at the mirror, where does the light go? Have them try it at different angles, where does the light go? Explain that some objects like mirrors, can redirect a beam of light, both others like the index card, can just block its path. Ask students to draw a model of what happened when the light hit the mirror in their science journals.
  
7. Call on student volunteers to choose objects from the bag of various objects and use the projector to create a shadow then ask the students...
  - What shape is the object? What shape is the shadow?
  - What color is the shadow? Does the shadow show any pattern (e.g different shades of lighter and darker)?
  - Have students hypothesize what shadows will look like for different objects and have them test their hypothesis.

**Optional Extension: If weather and time permits, teachers may bring students outside to observe the sun, the light that emerges from the clouds, and the shadows the sun casts.**



## Lesson Closing

Have students complete a 3-2-1 protocol. Ask them for three new facts they learned about shadows and light travel, two questions they may have about light, and one favorite part of the lesson. If students are having difficulty completing the 3-2-1 on their own, encourage them to work with a partner to complete the activity.

## Assessment(s)

- Students will complete “Using A Periscope” worksheet (assesses students’ knowledge on what a shadow will look like)
- Students will complete “Block the Light” Worksheet (Worksheets can be pasted into science journals or used in addition to the journal).
- OPTIONAL: You may also ask students to draw a person, a sun, and the shadow in their science journal

# Lesson 7: “Playing with Light and Shadows”

## (Literacy Lesson) *Taught by the Classroom Teacher*

### BACKGROUND

#### Overview of the Lesson

The lesson should be integrated into the literacy block or science block; it should be taught in small reading groups. In order for students to distinguish between fiction and nonfiction they will begin to identify characteristics of nonfiction text.

#### Focus Standard

**1.RI. 5** Know and use various text features (e.g. headings, tables of contents, glossaries, electronic menus, icons) to locate key facts or information in a text.

#### Learning Targets

1. I can use text features to make predictions.
2. I can write a caption that further explains a photo.

#### Assessment

Write a caption for the photo on p. 21 of the text (Worksheet 3)

#### Targeted Academic Language/Key Vocabulary

**Tier 2:** object, shadow, material, form

**Tier 3:** opaque, translucent, transparent

## RESOURCES AND MATERIALS

| Quantity        | Item   | Source            |
|-----------------|--|-------------------|
| <b>8 copies</b> | <b>Book : “Playing with Light and Shadows”</b> | <b>Bin</b>        |
| 2               | Text feature chart and KWL chart from lesson 2 | Classroom Teacher |
| 1               | Marker   | Classroom Teacher |
| 1               | Worksheet 3                                    | Binder            |
| 1               | Activator photograph                           | Classroom Teacher |

**\*\*Items in bold should be returned for use next year\*\***

## LESSON DETAILS

### Lesson Opening/ Activator

The classroom teacher should bring in another photograph as you did in lesson 1. Discuss the photograph and what additional information students learn about you from the photo. Tell students, “Sometimes an author wants to make sure you understand the information the photo is showing - and so they will write a word or sentence on or near the photograph, this is called a caption. Add ‘caption’ to the text feature chart, the photograph and caption.

### During the Lesson

1. **Prediction:** Give each student a copy of the book “Playing with Light and Shadows”. Read the title and show the cover photo and ask the students, what do you think this book is about? Do you think this is fiction or nonfiction? Review the difference between the two. Have students refer to text feature chart to predict what text features they will find if they are reading nonfiction. Using the think aloud strategy as in lesson 1 to demonstrate how you would use the photos, captions, and headings to inform your prediction, and model a text feature walk.
2. **KWL:** After making a prediction, ask students to remember what they learned about light with the science fellows. Is there anything they can add to the ‘L’ in the chart? What do they want to know? Depending on student responses add to

the appropriate part of the KWL chart.

- 3. Read:** After you have activated prior knowledge and set a purpose for reading using the KWL chart, read the book together with students. When you get to page 7 add the image example for caption to your text feature chart. Give students an opportunity to use headings, identify bold face words, use the glossary, and *emphasize how the captions specifically describe the photo*. Give students an opportunity to come up with captions for pages that don't have one.
- 4. Write:** Students will need their book and worksheet 3. Explain that they will be writing a caption for the photo on page 21. What is the photograph of? Students may draw the photograph in the box provided on the worksheet. Have students write their caption in the space provided.

## Lesson Closing

Tell students that this nonfiction book teaches us about light. Turn and talk to a partner and share one thing you learned about light. Add responses to KWL chart.

## Assessment

Write a caption for the photo on p. 21 of the text (Worksheet 3).

# Lesson 8: Light Interactions

## BACKGROUND

### Overview of the Lesson

Students will use a light table to explore transparent, translucent, and opaque materials. They will categorize items from transparent to opaque in order.

### Focus Standard

**1-PS4-3.** Conduct an investigation to determine the effect of placing materials that allow light to pass through them, allow only some light through them, block all the light, or redirect light when put in the path of a beam of light. [Clarification Statement: Effects can include some or all light passing through, creation of a shadow, and redirecting light. Quantitative measures are not expected.]

### Learning Target

I can demonstrate that light can pass through some objects and that some objects will stop light completely.

### Assessment(s)

- Students will complete “Just Passing Through” worksheet. Ask them to think of other items in the classroom or at home.
- Have them draw or write the name of the objects they can think of for each of the three categories.

### WIDA Language Objectives

Level 1-2: Students will sort objects to match the illustrated labels transparent, translucent, opaque.

Level 3-4: Students will complete the Transparent/Translucent/Opaque worksheet using an item name word bank.

## Key Vocabulary

**Tier 1:** light

**Tier 2:** source, material

**Tier 3:** translucent, transparent, opaque

## RESOURCES AND MATERIALS

| Quantity | Item   | Source            |
|----------|--|-------------------|
| 1-2      | <b>Light table – To be shared among T2L classrooms at grade level</b>  | <b>Bin</b>        |
| 4 bags   | <b>Assorted pieces of tissue paper, construction paper, clear plastic</b>  | <b>Bin</b>        |
| 4 bags   | <b>Pieces of transparent, translucent, &amp; opaque materials (well known classroom and household items, toys, recycled materials, scraps)</b> | <b>Bin</b>        |
| 1/ child | Transparent/Translucent/Opaque Worksheet   | Binder            |
| 1        | <b>Large blow up of Transparent/Translucent/Opaque Worksheet</b>   | <b>Bin</b>        |
| 3 colors | Dry eraser markers   | Classroom Teacher |
| 1/ child | “Just Passing Through” Worksheet   | Binder            |

**\*\*Items in bold should be returned for use next year\*\***

## LESSON DETAILS

### Lesson Opening/ Activator

Revisit and review previous lesson. Ask students:

- How does light travel? (in a straight line)
- Can it go around corners? (no)
- What happens when light is blocked? (creates a shadow)
- Does everything block light?
- Can light go through a wall? A window?

Explain that we are going to investigate what kinds of things light can go through using our light table. Show them how it works by putting an object on the table.

## During the Lesson

1. Use large laminated blow up of Transparent/Translucent/Opaque worksheet and dry erase markers for explanation



### Science Talk: Small Group and Whole Class Discussion

- a. Explain that light can go completely through some items, these items are what we call transparent. Have the students work with each other to come up with a list of three things which are transparent, then as a class make a list of things they think are transparent on the large worksheet on the board.
- b. Explain that light cannot go through some items, the light is completely blocked. We call these items opaque. These are the kinds of things that make a shadow. Have the students work with each other to come up with a list of three things which are opaque, then as a class make a list of things they think are opaque on the large worksheet on the board.
- c. Explain that some items allow some light to go through but not all of it, we call these translucent. Have the students work with each other to come up with a list of three things which are translucent then as a class make a list of things they think are translucent on the large worksheet on the board.

## 2. Investigation

Split the students into four groups, and provide a light table to each group. Explain that students will be using the light table to sort items that are transparent, translucent, and opaque. Distribute the bags with the tissue, paper and plastic, let them investigate these items and sort them into the three categories. You can demo this on an overhead projector as they do it at their light tables. Walk around and check in with the groups.

- a. You can ask the students; can you see light through that object?
- b. Can you see a little light or all the light? If they can only see a little light, discuss the fact that it is translucent.

- c. If you hold the object up to your light can you see clearly through it? If you can see all the way through it discuss the fact that it is transparent.
- d. If no light can come through it ask what would happen if I put this object in front of the projector? (It will create a shadow.)

### 3. Categorize

Give students individual worksheets and the bags with several different types of materials (must have several from each category). Have students test the materials and note their discoveries on their worksheets in the correct sections. Provide a word bank to students who need it. For students with limited language skills, have them sort the objects rather than writing the names of the objects (see WIDA Language Objectives).

### Lesson Closing

Revisit the master worksheet on the board to see if you have objects in the correct categories, are there any items that need to be moved to a new category? Discuss the ones that weren't correct. How do we know they need to be moved?

### Assessment(s)

- Students will complete "Just Passing Through" worksheet. Ask them to think of other items in the classroom or at home.
- Have them draw or write the name of the objects they can think of for each of the three categories.

# Lesson 9: Light Art

## BACKGROUND

### Overview of the Lesson

Students will use the knowledge they've gained about light and materials that block light to make suncatchers with transparent, translucent, and opaque materials.

### Focus Standard

**1-PS4-3.** Conduct an investigation to determine the effect of placing materials that allow light to pass through them, allow only some light through them, block all the light, or redirect light when put in the path of a beam of light. [Clarification Statement: Effects can include some or all light passing through, creation of a shadow, and redirecting light. Quantitative measures are not expected.]

### Learning Target

I can demonstrate that light can pass through some objects and that some objects will stop light completely.

### Assessment

Students will create a sun catcher using their knowledge of light and materials that let light through them. Discussion with each student during the planning phase will serve as the assessment. Students should be able to indicate the places in their design which will be transparent, translucent, and opaque and explain what those terms mean.

### Targeted Academic Language/Key Vocabulary

**Tier 1:** light, shadow

**Tier 2:** source, material

**Tier 3:** translucent, transparent, opaque

## RESOURCES AND MATERIALS

| Quantity         | Item  | Source                        |
|------------------|---|-------------------------------|
| <b>1</b>         | <b>Model Sun Catcher</b>  | <b>Bin</b>                    |
| <b>1 Roll</b>    | <b>Wax Paper (return leftovers) – Divide into sheets about the size of an 8 ½ x 11 piece of paper</b> | <b>Bin</b>                    |
| 1/child          | Blank 8 ½ x 11 sheets of paper  | Classroom Teacher             |
| <b>1 jug</b>     | <b>Liquid Starch, or a 50/50 mix of Elmer’s Glue and Water</b>  | <b>Bin</b>                    |
| 1/child          | Paint brush   | Art Teacher/Classroom Teacher |
| <b>Selection</b> | <b>Multiple colors of tissue paper (return leftovers)</b>   | <b>Bin</b>                    |
| <b>1 spool</b>   | <b>String or yarn</b>   | <b>Bin</b>                    |
| 1/child          | Scissors  | Classroom Teacher             |
| 1-2              | Hole punchers   | Classroom Teacher             |
| 1-2              | Scotch tape   | Classroom Teacher             |
| <b>1</b>         | <b>Light Table from previous lesson</b>   | <b>Bin</b>                    |

**\*\*Items in bold should be returned to the bin for use next year\*\***

## LESSON DETAILS

### Lesson Opening/ Activator

Tell the students that they will be using their knowledge of light, shadows, transparency, translucency, and opaqueness to create a sun catcher. Show students a model sun catcher, hold it in front of the light and ask them what they notice. Does all the light come through? Which areas are transparent, translucent, and opaque? What happened in areas where there were more than one color overlapping or the paper was thick? (Paper becomes opaque) Explain that they will be making their own suncatcher to take home.

## During the Lesson

**Note:** Full activity with pictures can be found at: <http://artfulparent.com/2010/04/tissue-paper-stained-glass.html>



### 1. Explore the Materials

Have students investigate the tissue paper on the light tables. Can you see light through it? (Yes, it's translucent) What happens when you put more than one piece on at the same time? (It changes color and lets less light through - still translucent) How many pieces will make it opaque?

### 2. Make the Sun catcher

- a. Explain that in making their sun catcher they should have some parts that are transparent, some that are translucent, and some that are opaque. Explain the steps below and post them in the front of the room.
- b. **Choose colors** - Have students choose their colors and rip up the tissue paper into smaller pieces. (They may go back to the light table to see what the colors will look like.)
- c. **Plan** - Have students arrange the tissue paper on their blank write paper to demonstrate how they can arrange their pieces of tissue paper to create the three types of light filters (transparent, translucent, and opaque). Have an adult check each design when students have completed it and discuss the three types of light filters – THIS IS YOUR ASSESSMENT OF THE LEARNING OBJECTIVE.

**Optional Extension: Students can use the internet to look up suncatcher designs that meet the assignment requirements.**

- d. **Starch colors** - Give each student a small cup of liquid starch (or a 50/50 mix of Elmer's glue and water) and a paintbrush. Demonstrate how you put a piece of tissue paper down on the wax paper and brush some liquid starch over it. Have them try it. Keep adding more colors making sure to leave some areas open. Remind them that if they want opaque areas, the colors will have to be overlapped.

- e. **Hang** - Hole punch 2 holes near the top and put a string through. Lie the sun catcher flat to dry then hang them windows when they are completely dry.



## Lesson Closing

As the sun catchers dry, use this time to review all that they have learned about light, revisiting the KWL chart.

## Assessment

Students will create a sun catcher using their knowledge of light and materials that let light through them. Discussion with each student during the planning phase will serve as the assessment. Students should be able to indicate the places in their design which will be transparent, translucent, and opaque and explain what those terms mean.

# Lesson 10: “Sending Messages with Light and Sound” (Literacy Lesson) *Taught by the Classroom Teacher*

## BACKGROUND

### Overview of the Lesson

The lesson should be integrated into the literacy block or in the science block. It should be taught in small reading groups. In order for students to distinguish between fiction and nonfiction they will begin to identify characteristics of nonfiction text.

### Focus Standard

**1.RI.5** Know and use various text features (e.g., headings, tables of contents, glossaries, electronic menus, icons) to locate key facts or information in a text.

### Learning Targets

1. I can identify bold face words, headings, and captions in an informational text.
2. I can use text features to make predictions.

### Assessment

Teachers should develop questions to ask the students after they’ve read the Sending Messages book to gauge comprehension and understanding.

### Targeted Academic Language/Key Vocabulary

**Tier 2:** message, information, distance

## RESOURCES AND MATERIALS

| Quantity | Item   | Source            |
|----------|--|-------------------|
| 8 copies | <b>Book : “Sending Messages with Light and Sound”</b>        | <b>Bin</b>        |
| 2        | Large chart paper (text feature chart and KWL from lesson 2) | Classroom Teacher |
| 1        | Marker   | Classroom Teacher |

**\*\*Items in bold should be returned for use next year\*\***

## LESSON DETAILS

### Lesson Opening/ Activator

Ask for a volunteer. Tell the student that when they hear one bell ring (or hand clap if you don’t have a bell) they should jump, if they hear 2 bells ring they should hop on one foot continuously. Ring the bell with either one or two rings. Play with this idea a few times. Tell students that you were using the bell or a sound to send a signal. We’ve discovered many things about light and sound. Now we will be learning about how we use light and sound to send messages or signals.

### During the Lesson

1. **Prediction:** Give each student a copy of the book “Sending Messages with Light and Sound”. Read the title and show the cover photo. Ask students, what do you think this book is about? Do you think this is fiction or nonfiction? Review the difference between the two. Use the think aloud strategy for a text feature walk as in previous lessons to demonstrate how you would use the photos, captions, and headings to inform your prediction.
2. **Read:** Read the book together with students. On page 4 make sure students use the glossary to read the definition of the bold face words. Add ‘messages’ and ‘information’ to the text feature chart. On page 5 ask students what the author means by “over a distance”. On page 10 ask, “What message do traffic lights tell drivers”. On page 12 point out the new heading and remind students that, all of the following sentences should tell us about using *sound* to tell messages

instead of light. Discuss how the main text of that section relates back to the heading. On page 15 ask, “How do you talk over a distance?” On page 22, you may ask students “If you were the author what caption would you put on this page?”



## **Lesson Closing**

Ask students to discuss what else they learned today about light and sound. Add to the KWL chart as well. Tell students that they will be learning more about sending messages with light and sound during their science lessons.

## **Assessment**

Teachers should develop questions to ask the students after they’ve read the Sending Messages book to gauge comprehension and understanding.

# Lesson 11: Sending Messages: Sound

## BACKGROUND

### Overview of the Lesson

In this lesson students will learn that sound comes from a source and travels. Students will engage in an activity that has them to distinguish the source of the sound. This will lead into a discussion about sounds the students hear in school and what sounds are sending the messages (ex. school bell, teachers use of sounds to get students attention, coach whistles etc). Students will participate in several activities that use sound to send signals, for example paper cup and string “telephones,” and a pattern of drum beats”.

### Focus Standard(s)

**1-PS4-1.** Demonstrate that vibrating materials can make sound and that sound can make materials vibrate. [Clarification Statement: Examples of vibrating materials that make sound could include tuning forks, a stretched string or rubber band, and a drum head. Examples of how sound can make materials 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 send a signal 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. Technological details for how communication devices work are not expected.]

### Learning Targets

1. I can create a device that uses vibration to transmit a message to their partner.
2. I can explain the path or vibration used in my communication device.

## Assessment(s)

- Teacher should have students write about their findings in their journals. Draw a picture of your device and words to describe how it works.
- Students should each be given a copy of the Walkie-Talkie worksheet and instructed to cut up the pictures and place them in the correct order. (If students have trouble cutting, this step can be done ahead of time.)

## Targeted Academic Language/Key Vocabulary

**Tier 1:** walkie-talkie,

**Tier 2:** communicate, vibration, message, travel, source

## RESOURCES AND MATERIALS

| Quantity | Item  | Source            |
|----------|---|-------------------|
| <b>1</b> | <b>Ball of yarn</b>                             | <b>Bin</b>        |
| <b>2</b> | <b>Wax coated paper cups per student pair</b>   | <b>Bin</b>        |
| 1        | Scissors  | Classroom Teacher |
| 1        | Crayons or markers to decorate “walkie-talkies” | Classroom Teacher |
| 1/child  | Walkie-Talkie worksheet                         | Binder            |

**\*\*Items in bold should be returned for use next year\*\***

## LESSON DETAILS

### Lesson Opening/ Activator



#### Science Talk: Partner discussion

The teacher should begin the lesson by reviewing vibrations and that sounds are created by vibration. The teacher should lead a group discussion about how sounds can be used to communicate a message. The teacher should give examples like

when the school bell rings, that sends students a message which means that school is over/ or that it's time for school to begin. At this point the teacher should ask the students to turn and talk with their partner to come up with their own examples of specific sounds which send a message (like a phone vibration for a text, church bells ringing which tells what hour of the day it is, an audience clapping after a performance, etc.) Tell the students that they will be using their prior knowledge of sound and vibrations to construct a “walkie-talkie,” using a cup and some string. **(SP-2: Developing and Using Models)**. This activity is adapted from: [http://www.ehow.com/way\\_6067683\\_homemade-walkie-talkies.html](http://www.ehow.com/way_6067683_homemade-walkie-talkies.html)

## During the Lesson

**Preparation:** Poke one small hole at the bottom of each cup before the lesson begins, make sure the holes are tiny—use a tack or pen to make the hole. If the hole is too big, the device will not work.

### Create

1. Demonstrate how to construct the walkie-talkie. Pull the string through one cup and tie a knot at the end so it prevents the string from being pulled out of the hole. Thread the other side of the string through the second cup and tie a knot at the end. You should have two cups joined by one piece of string.
2. Divide the students into pairs. Distribute the materials and have each pair complete their device. Students may need assistance tying the knot in the string. For fun, allow students to decorate their walkie-talkies.

### Use

1. Put your homemade walkie-talkies to the test, one participant walks to one end of the room with one cup, while the other participant holds the other cup up to their ear. Then one student can talk while the other listens, have them switch who is talking and who is listening. The string must be pulled tightly to ensure that the vibration picks up the sound of students voices. The teacher should propose variations to this like letting students go out in the hall, and seeing if they can still hear each other in different areas, around a corner, under a desk, etc.

### Extension

Allow the students to construct more walkie-talkies with differing lengths of string, or different types of cups or string.

## Lesson Closing

Discuss the observations made during this lesson, make sure students understand that the sound came from one person's mouth, traveled across the string *through vibration*, and was then picked up by the cup on the opposite side of the string. Teachers should reinforce how sound is used to communicate a message. Teachers should also remind students that not only can our voices send a message, but sounds like church bells and clapping transmit messages too.

## Assessment(s)

- Teacher should have students write about their findings in their journals. Draw a picture of your device and words to describe how it works.

Sentence Frames:

I heard \_\_\_ when I used my walkie-talkie.

Vibration helped me to hear by \_\_\_.

The walkie-talkie worked by using vibration to \_\_\_.

- Students should each be given a copy of the Walkie-Talkie worksheet and instructed to cut up the pictures and place them in the correct order. (If students have trouble cutting, this step can be done ahead of time.)

# Lesson 12: Sending Messages: Light

## BACKGROUND

### Overview of the Lesson

Students will build upon their knowledge that light travels in a beam and give examples of how we use light to send signals (light house, street lights). Students will use a specific light source to send signals.

### Focus Standard

**1-PS4-4.** Use tools and materials to design and build a device that uses light or sound to send a signal 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. Technological details for how communication devices work are not expected.]

### Learning Target

I can communicate a message using just a light source.

### Assessment(s)

- Students will move in the correct direction when signaled with the flashlight
- Student science journal entries throughout the lesson

### WIDA Language Objectives

(Dependent on the needs of your ELL students)

### Targeted Academic Language/Key Vocabulary

**Tier 1:** flashlight

**Tier 2:** communicate, demonstrate, message

## RESOURCES AND MATERIALS

| Quantity  | Item   | Source            |
|-----------|--|-------------------|
| <b>12</b> | <b>Small flashlights</b>   | <b>Bin</b>        |
| 1/child   | Science journal  | Classroom Teacher |
| 1 pack    | Tissue paper (needs to have red, yellow, and green pieces in the pack) | Bin               |

**\*\*Items in bold should be returned for use next year\*\***

## LESSON DETAILS

### Lesson Opening/ Activator

Begin the lesson by reviewing how vibration and sound can be used to communicate a message. Be sure to emphasize that everything they have been learning about light, sound, and how they travel are all really starting to connect.

### During the Lesson

This lesson is adapted from “First Grade Next Generation Science Standards”



#### Science Talk: Small Group Discussions

1. Divide students into groups of three and give each group a flashlight.
2. The science fellow or classroom teacher will use different color tissue paper (red, yellow, green) to model traffic stop lights and will explain their importance in the real world to help controlling traffic and prevent accidents. Explain that red means stop, yellow means slow down, and green means go. Explain that different lights can mean different things.
3. Now explain that each group will devise a plan or sequence of light flashes to tell the other group members to come closer to the beam of light, or move further away from it. Examples of this could be one flash is move closer, two flashes

is to move further away. Another option would be to use different colored tissue paper to change the color of the light beam (green to move closer and red to move further away, etc.)

**Note: At this point the teacher should model a flashing sequence with a student to move closer and further away.**

4. Allow the students to come up with their own sequences, and record them in their science journals. Be sure the students practice their signals with their group.
5. Have the groups demonstrate their light signals in front of the class, you can have the students watching guess what each signal is and what it means.
6. Feel free to expand the lesson, and challenge the students to add a third signal which could direct the student to remain in the same spot, sit down, etc.

**Extension:** If there is extra time, students could play the game “telephone” using only their flashlights. Instead of a “move forward” and “move backward” signal, just have the students repeat the sequence to the person next to them. The teacher can come up with the initial pattern and, moving down the line one by one, students can send the signal to the person next to them. The teacher can see if everyone can mimic the same sequence. **(SP#8: Obtaining, Evaluating, and Communicating Information).**

## Lesson Closing

Review that lights can send messages/signals in many ways using color, frequency (amount of times it blinks), etc. Ask the students to write three examples of light sources which send messages in their science journals. Remind students that lights can send a message over a long or short distance and that light travels in a straight line (using “signaling around the corner” as an example).

## Assessment(s)

- Students will move in the correct direction when signaled with the flashlight
- Student science journal entries throughout the lesson

# Lesson 13: Communication Device

## BACKGROUND

### Overview of the Lesson

In this lesson, students will work with a partner to construct a communication device using sound or light. Students will be provided with specific materials and will use knowledge from Lessons 11 and 12 to construct their own communication device.

### Focus Standard(s)

**1-PS4-1.** Demonstrate that vibrating materials can make sound and that sound can make materials vibrate. [Clarification Statement: Examples of vibrating materials that make sound could include tuning forks, a stretched string or rubber band, and a drum head. Examples of how sound can make materials vibrate could include holding a piece of paper near a speaker making sound and holding an object near a vibrating tuning fork.]

**1-PS4-3.** Conduct an investigation to determine the effect of placing materials that allow light to pass through them, allow only some light through them, block all the light, or redirect light when put in the path of a beam of light. [Clarification Statement: Effects can include some or all light passing through, creation of a shadow, and redirecting light. Quantitative measures are not expected.]

**1-PS4-4.** Use tools and materials to design and build a device that uses light or sound to send a signal 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. Technological details for how communication devices work are not expected.]

## Learning Targets

1. I can design and construct a device that will create light or sound.
2. I can produce a message using light or sound.

## Assessment(s)

- CEPA work products scored against CEPA rubric
- Lesson 13 worksheet

## WIDA Language Objectives

(Dependent on the needs of your ELL students)

## Targeted Academic Language/Key Vocabulary

**Tier 2:** model, message, signal, device, create, design

## RESOURCES AND MATERIALS

| Quantity         | Item   | Source            |
|------------------|--|-------------------|
| <b>1</b>         | <b>Large Box of Popsicle Sticks</b>                  | <b>Bin</b>        |
| <b>Large bag</b> | <b>Assorted materials</b>                            | <b>Bin</b>        |
| <b>12</b>        | <b>Safety mirrors</b>                                | <b>Bin</b>        |
| 1                | Paper and Pencil                                     | Classroom Teacher |
| <b>5</b>         | <b>Rolls of tape (any kind, the more the better)</b> | <b>Bin</b>        |
| <b>50</b>        | <b>Sheets of colored construction paper</b>          | <b>Bin</b>        |
| <b>10</b>        | <b>Flashlights</b>                                   | <b>Bin</b>        |
| Assorted         | Classroom materials suitable for project             | Classroom Teacher |

**\*\*Items in bold should be returned for use next year\*\***

## LESSON DETAILS

### Lesson Opening/ Activator

Begin with a class discussion reminding the students what they did in the last two lessons (building a walkie talkie and creating light signals with a flashlight). Now, they get to be more creative and will get to build their own device/tool/model which sends a message over a distance using light and/or sound. Explain the task and discuss the SOS signal, demonstrating it with clapping and the on/off of a flashlight.

Then show the students the materials they will be using to build their own device, so that they know what they have to build with. Explain that they cannot turn the flashlight on and off to make their signal. They must leave it on as a light source, but could figure out another way to make the SOS pattern using the light.

### During the Lesson

1. Once the students have been shown the materials they can use to build their own device, they must first make a design on paper.
2. It is suggested each student come up with more than one idea on paper, draw a design on paper, and explain how their device will work before actually creating it.

**Optional Extension: Students may research devices on the internet to get an idea of what they would like to create.**

3. Once the students have cleared their design with the science fellow or teacher they can start to build their device.
4. Upon completion, each student should draw or write down how their device/model sends its message in their science journals.

Sentence Frames:

My device was made of \_\_\_\_.

My signal was \_\_\_\_.

I used light by \_\_\_\_.

I used sound by \_\_\_\_.

## Lesson Closing

Students can either put their designs on display and visit other students' stations, or present them individually to the rest of the class (teacher choice).

Review the KWL chart one final time to see if there is anything to add. The "Learning" column should include at least the following:

- Sounds are caused by vibrations – something must be vibrating to make a sound
- A loud sound can make other things vibrate
- Light beams travel in straight lines
- Some things can block light beams either completely (creating a shadow) or partially (letting only a little light through)
- Some things can bend a light beam
- We can use light and sound to communicate across distances

## Assessment(s)

- CEPA work products scored against CEPA rubric
- Lesson 13 worksheet

# Science Talk and Oracy in T2L Units



**Science talk is much more than talking about science.** In line with the science and engineering practices, students are expected to make a claim that can be supported by scientific evidence. The MA STE Standards (and the NGSS) value the importance of engaging in an argument from evidence. NGSS defines how this practice takes form in the real world: *“In science, reasoning and argument are essential for identifying the strengths and weaknesses of a line of reasoning and for finding the best explanation for a natural phenomenon. Scientists must defend their explanations, formulate evidence based on a solid foundation of data, examine their own understanding in light of the evidence and comments offered by others, and collaborate with peers in searching for the best explanation for the phenomenon being investigated.”*

Students are asked to participate in articulate and sensible conversations in which they are able to communicate their ideas effectively, listen to others to understand, clarify and elaborate ideas, and reflect upon their understanding. These forms of talk can be developed using scaffolds such as the A/B Talk protocol (below) and strategies for class discussions (from the Talk Science Primer, link below). Oracy is developed in the physical, linguistic, cognitive, and social-emotional realms; each of these realms can be expanded upon over time in order to develop a thoughtful speaker. Being able to display appropriate body language, use proper tone and grammar, be thoughtful and considerate thinkers, and allow space for others thoughts and opinions are all important facets of oracy to work on and through with students. Incorporating the appropriate scaffolding is an important aspect of fostering these skills. Techniques for teaching effective science talk often include modeling, discussion guidelines, sentence-starters, and generating roles, while gradually putting more responsibility on students to own their thinking and learning.

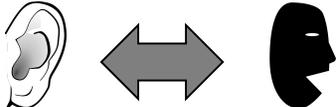
Part of creating a safe school environment for students is allowing them a space that is comfortable enough for them to express ideas and ask questions, while being validated for their thoughts and questions; students should be feel comfortable and confident when speaking and listening for understanding. Effective talk is an important part of being an active, intelligent member of a community and society. Successful development in oracy is important for future employability and general well-being of adults.

**The following resources should be helpful examples of how to employ effective use of progressive oracy and science talk in your classrooms.**

- Oracy in the Classroom: <https://www.edutopia.org/practice/oracy-classroom-strategies-effective-talk>
- Science Talk Primer: [https://inquiryproject.terc.edu/shared/pd/TalkScience\\_Primer.pdf](https://inquiryproject.terc.edu/shared/pd/TalkScience_Primer.pdf)

# A/B Talk Protocol

Adapted from <https://ambitioussciencelearning.org/ab-partner-talk-protocol/>

|   |   |
|---|---|
| <p><b>1. Share your ideas</b></p> <p style="text-align: center;"><b>Partner A</b></p>  <ul style="list-style-type: none"> <li>• I think ____ happened because...</li> <li>• Evidence that supports my idea is...</li> <li>• The activity we did with ____ helps me know more about ____ because...</li> <li>• One thing I'm wondering about is...</li> </ul> | <p><b>2. Listen to Understand</b></p> <p style="text-align: center;"><b>Partner B</b></p>  <ul style="list-style-type: none"> <li>• I heard you say _____. What makes you think that?</li> <li>• I heard you say _____. What if _____?</li> <li>• Can you explain the part about _____ again?</li> <li>• What do you mean when you say _____?</li> </ul> |
| <p><b>3. Clarify and elaborate</b></p> <p style="text-align: center;"><b>Partner A</b></p>  <p>Answer partner's questions or ask for clarification in order to understand a question.</p>  | <p><b>4. Repeat steps 2 &amp; 3 until all questions are answered</b></p>   |
| <p><b>5. Switch roles and repeat steps 1-4</b></p>   | <p><b>6. Reflect on your understanding in writing</b></p> <ul style="list-style-type: none"> <li>• My idea about ____ changed when my partner said _____.</li> <li>• I will add ____ to my idea about ____ because...</li> <li>• I still have questions about...</li> <li>• I may be able to answer my question(s) if I could investigate _____.</li> </ul>   |

# List of Unit Resources

## Lesson 1: Sensing Light and Sound

| Quantity        | Item  | Source            |
|-----------------|---|-------------------|
| <b>8 copies</b> | <b>Book : “Sensing Light and Sound” by Jennifer Boothroyd</b> | <b>Bin</b>        |
| 2               | Large chart paper   | Classroom Teacher |
| 1               | Marker  | Classroom Teacher |
| 1               | Family photograph   | Classroom Teacher |
| 1               | Worksheet 1   | Binder            |
| 1               | Tally Chart   | Binder            |

## Lesson 2: Intro to Light and Sound

| Quantity     | Item                       | Source  |
|--------------|----------------------------|---|
| As available | Musical Instruments        | Music Teacher/ Classroom Teacher/Science Fellow |
| 25           | Plastic straws             | Bin   |
| Class set    | Scissors                   | Classroom Teacher                               |
| 1 per child  | Pitch and Volume Worksheet | Binder  |
| 20           | Plastic Kazoos             | Bin   |

## Lesson 3: Vibrations Make Sound

| Quantity        | Item   | Source            |
|-----------------|--|-------------------|
| <b>8 copies</b> | <b>Book : “Vibrations Make Sound”</b>                        | <b>Bin</b>        |
| 2               | Large chart paper (text feature chart and KWL from lesson 1) | Classroom Teacher |

|              |                                   |                   |
|--------------|-----------------------------------|-------------------|
| 1            | Marker                            | Classroom Teacher |
| <b>1 set</b> | <b>Color images of road signs</b> | <b>Bin</b>        |
| 1            | Worksheet 2                       | Binder            |

#### Lesson 4: Visualizing Vibrations

| Quantity      | Item  | Source                                |
|---------------|---|---------------------------------------|
| 2-3           | Drums   | Music<br>Teacher/Classroom<br>Teacher |
| <b>1</b>      | <b>Small bag of rice</b>  | <b>Bin</b>                            |
| <b>1</b>      | <b>Tuning Fork</b>  | <b>Bin</b>                            |
| <b>1</b>      | <b>Bowl for water</b>   | <b>Bin</b>                            |
| <b>20</b>     | <b>Popsicle sticks</b>  | <b>Bin</b>                            |
| <b>10</b>     | <b>Rubber bands</b>   | <b>Bin</b>                            |
| <b>3 sets</b> | <b>Metal fork and spoon</b>   | <b>Bin</b>                            |
| 4             | Rulers  | Classroom Teacher                     |
| 1/child       | “Visualizing Vibrations” worksheet  | Binder                                |
| 1/child       | Science journal   | Classroom Teacher                     |
| 1             | Projector   | Classroom Teacher                     |
|               | <a href="https://www.youtube.com/watch?v=ZxYmPAEW840">https://www.youtube.com/watch?v=ZxYmPAEW840</a> | CMC website                           |
|               | <a href="https://www.youtube.com/watch?v=ekRXkSe0G7M">https://www.youtube.com/watch?v=ekRXkSe0G7M</a> | CMC website                           |

## Lesson 5: Creating Vibrations

| Quantity             | Item  | Source                     |
|----------------------|---|----------------------------|
| <b>Samples</b>       | <b>Homemade musical instruments</b>   | <b>Science Fellows/Bin</b> |
| 2-3                  | Staplers  | Classroom Teacher          |
| Enough for the class | Crayons   | Classroom Teacher          |
| <b>10</b>            | <b>Any cylindrical container with a top</b>   | <b>Bin</b>                 |
| 2 per child          | Pencils   | Classroom Teacher          |
| 1 pack               | Construction paper  | Bin                        |
| <b>10</b>            | <b>Small boxes with or without lids</b>   | <b>Bin</b>                 |
| <b>1 bag</b>         | <b>Rubber bands of assorted sizes</b>   | <b>Bin</b>                 |
| <b>1 bag</b>         | <b>Dried beans</b>  | <b>Bin</b>                 |
| <b>1 roll</b>        | <b>Plastic Wrap</b>   | <b>Bin</b>                 |
| A few                | Rulers  | Classroom Teacher          |
| <b>5 rolls</b>       | <b>Masking tape</b>   | <b>Bin</b>                 |
| 1                    | Projector   | Classroom Teacher          |
| Assorted             | Classroom materials suitable for project  | Classroom Teacher          |
|                      | <a href="https://www.youtube.com/watch?v=INqfM1kdfUc">https://www.youtube.com/watch?v=INqfM1kdfUc</a> | CMC website                |

## Lesson 6: Light Investigation

| Quantity  | Item  | Source            |
|-----------|---|-------------------|
| 1         | <b>Book: Bear Shadow by Frank Asch</b>                  | <b>Bin</b>        |
| <b>1</b>  | <b>Plastic Bin</b>                                      | <b>Bin</b>        |
| 1         | Small carton of milk from cafeteria                     | Classroom Teacher |
| <b>12</b> | <b>Small flashlights - check batteries prior to use</b> | <b>Bin</b>        |

|                |  |                   |
|----------------|--|-------------------|
| <b>12 sets</b> | <b>3 Index cards with holes punched in middle</b>  | <b>Bin</b>        |
| <b>1</b>       | <b>Lump of clay (enough to make stands for the index cards)</b>  | <b>Bin</b>        |
| <b>12</b>      | <b>Safety mirrors</b>  | <b>Bin</b>        |
| <b>12</b>      | <b>Index cards</b>   | <b>Bin</b>        |
| 1/child        | Science Journals   | Classroom Teacher |
| 1              | Projector  | Classroom Teacher |
| <b>1</b>       | <b>Bag of objects to try shadows with - some should be patterned - wooden or plastic toys &amp; blocks</b> | <b>Bin</b>        |
| 1              | “Using A Periscope” worksheet per student  | Binder            |
| 1              | “Block the Light” worksheet per student  | Binder            |

### Lesson 7: Playing with Light and Shadows

| Quantity        | Item   | Source            |
|-----------------|--|-------------------|
| <b>8 copies</b> | <b>Book : “Playing with Light and Shadows”</b> | <b>Bin</b>        |
| 2               | Text feature chart and KWL chart from lesson 2 | Classroom Teacher |
| 1               | Marker   | Classroom Teacher |
| 1               | Worksheet 3                                    | Binder            |
| 1               | Activator photograph                           | Classroom Teacher |

### Lesson 8: Light Interactions

| Quantity      | Item   | Source     |
|---------------|--|------------|
| <b>1-2</b>    | <b>Light table - To be shared among T2L classrooms at grade level</b>  | <b>Bin</b> |
| <b>4 bags</b> | <b>Assorted pieces of tissue paper, construction paper, clear plastic</b>  | <b>Bin</b> |
| <b>4 bags</b> | <b>Pieces of transparent, translucent, &amp; opaque materials (well known classroom and household items, toys, recycled materials, scraps)</b> | <b>Bin</b> |

|          |  |                   |
|----------|--|-------------------|
| 1/ child | Transparent/Translucent/Opaque Worksheet                         | Binder            |
| <b>1</b> | <b>Large blow up of Transparent/Translucent/Opaque Worksheet</b> | <b>Bin</b>        |
| 3 colors | Dry eraser markers   | Classroom Teacher |
| 1/ child | "Just Passing Through" worksheet                                 | Binder            |

### Lesson 9: Light Art

| Quantity         | Item  | Source                        |
|------------------|---|-------------------------------|
| <b>1</b>         | <b>Model Sun Catcher</b>  | <b>Bin</b>                    |
| <b>1 Roll</b>    | <b>Wax Paper (return leftovers) - Divide into sheets about the size of an 8 ½ x 11 piece of paper</b> | <b>Bin</b>                    |
| 1/child          | Blank 8 ½ x 11 sheets of paper  | Classroom Teacher             |
| <b>1 jug</b>     | <b>Liquid Starch, or a 50/50 mix of Elmer's Glue and Water</b>  | <b>Bin</b>                    |
| 1/child          | Paint brush   | Art Teacher/Classroom Teacher |
| <b>Selection</b> | <b>Multiple colors of tissue paper (return leftovers)</b>   | <b>Bin</b>                    |
| <b>1 spool</b>   | <b>String or yarn</b>   | <b>Bin</b>                    |
| 1/child          | Scissors  | Classroom Teacher             |
| 1-2              | Hole punchers   | Classroom Teacher             |
| 1-2              | Scotch tape   | Classroom Teacher             |
| <b>1</b>         | <b>Light Table from previous lesson</b>   | <b>Bin</b>                    |

### Lesson 10: Sending Messages with Light and Sound

| Quantity | Item   | Source            |
|----------|--|-------------------|
| 8 copies | <b>Book : “Sending Messages with Light and Sound”</b>        | <b>Bin</b>        |
| 2        | Large chart paper (text feature chart and KWL from lesson 2) | Classroom Teacher |
| 1        | Marker   | Classroom Teacher |

### Lesson 11: Sending Messages- Sound

| Quantity | Item  | Source            |
|----------|---|-------------------|
| <b>1</b> | <b>Ball of yarn</b>                             | <b>Bin</b>        |
| <b>2</b> | <b>Wax coated paper cups per student pair</b>   | <b>Bin</b>        |
| 1        | Scissors  | Classroom Teacher |
| 1        | Crayons or markers to decorate “walkie-talkies” | Classroom Teacher |
| 1/child  | Walkie Talkie Worksheet                         | Binder            |

### Lesson 12: Sending Messages- Light

| Quantity  | Item   | Source            |
|-----------|--|-------------------|
| <b>12</b> | <b>Small flashlights</b>   | <b>Bin</b>        |
| 1/child   | Science journal  | Classroom Teacher |
| 1 pack    | Tissue paper (needs to have red, yellow, and green pieces in the pack) | Bin               |

### Lesson 13: Communication Device

| Quantity         | Item                                | Source     |
|------------------|-------------------------------------|------------|
| <b>1</b>         | <b>Large Box of Popsicle Sticks</b> | <b>Bin</b> |
| <b>Large bag</b> | <b>Assorted materials</b>           | <b>Bin</b> |
| <b>12</b>        | <b>Safety mirrors</b>               | <b>Bin</b> |

|          |  |                   |
|----------|--|-------------------|
| 1        | Paper and Pencil                                     | Classroom Teacher |
| 5        | <b>Rolls of tape (any kind, the more the better)</b> | <b>Bin</b>        |
| 50       | <b>Sheets of colored construction paper</b>          | <b>Bin</b>        |
| 10       | <b>Flashlights</b>                                   | <b>Bin</b>        |
| Assorted | Classroom materials suitable for project             | Classroom Teacher |