Introduction
Diana M. Anaya
FLA 518
Unit Selection

1. Title: “Sound”
2. Grade Level: Fifth grade, Science
3. Target Group: Mainstream class with integrated ELL students
4. Sources for Lesson: New Haven Public School Curriculum (Science)
   website: www.newhavenscience.org/51UNHSoundUnit.htm
5. Sources for written materials: New Haven Public School Curriculum (Science)
   website: www.newhavenscience.org/51UNHSoundUnit.htm
6. Learning Goals:
   I want my students to know the factors that affect the loudness of sound that is produced
   by vibrating objects. I want my students to know the relationship between loudness of sound and
   the size of the vibration. I want my students to know the difference between loudness and pitch. I
   want my students to know the relationship between the size, tension, tightness, and or speed of
   vibrating objects and pitch. I want my students to know how sound is transmitted, reflected
   and/or absorbed by different materials. Lastly, I want my students to know which material is
   better at absorbing, transmitting and reflecting sound.
Lesson 1
Diana M. Anaya
Grade Level: 5th grade/Science
Audience: Mainstream class integrated ELL students

Unit Title: Sound

Lesson 1
Content Objectives:                                Language Objectives:
1. SWBAT identify the factors that affect the loudness of sound that is produced by vibrating objects.
2. SWBAT describe the relationship between loudness of sound and the size of the vibration.

1. SWBAT use vocabulary to discuss and write what vibration is and how it is caused.
2. SWBAT discuss and write what is done to make the noise, rank the noise (from loudest to quietest), and measure the loudness as compared to the standard sound.

Performance Indicators
Lesson 1

<table>
<thead>
<tr>
<th>Domain/Topic</th>
<th>Level 5</th>
<th>Level 4</th>
<th>Level 3</th>
<th>Level 2</th>
<th>Level 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speaking /Listening: Vibrations and Loudness of Sound</td>
<td>Students will lead a group discussion by using complete sentences about what vibration feels like, what causes vibrations, and what makes a sound louder or softer.</td>
<td>Students will participate in small group discussion by using short phrases about what vibration feels like, what causes vibrations, and what makes a sound louder or softer.</td>
<td>Students will participate in small group discussion by generating answers about what vibration feels like, what causes vibrations, and what makes a sound louder or softer by using sentence starters.</td>
<td>Students will participate in small group discussion by generating 1 to 2 word answers (from a word bank) about what vibration feels like, what causes vibrations, and what makes a sound louder or softer.</td>
<td>Students will participate in small group discussion by repeating the correct short phrases (given in a phrase bank) about what vibration feels like, what causes vibrations, and what makes a sound louder or softer.</td>
</tr>
<tr>
<td>Reading/Writing:</td>
<td>Students will use content related vocabulary to write complete sentences in order to complete a chart and answer questions describing: what they did to make noise, how they ranked them from quietest to loudest and the relationship between loudness of sound and size of vibration, in a small group.</td>
<td>Students will use short phrases to complete a chart and answer questions describing: what they did to make noise, how they ranked them from quietest to loudest and the relationship between loudness of sound and size of vibration, in a small group.</td>
<td>Students will use sentence starters and a word bank to complete a chart and answer questions describing: what they did to make noise, how they ranked them from quietest to loudest and the relationship between loudness of sound and size of vibration, with a partner.</td>
<td>Students will write 1 or 2 words (from the word bank) to complete a chart and answer questions describing: what they did to make noise, how they ranked them from quietest to loudest and the relationship between loudness of sound and size of vibration, one on one with the teacher's assistance.</td>
<td></td>
</tr>
<tr>
<td>Function</td>
<td>Situation</td>
<td>Expression</td>
<td>Words/Phrases</td>
<td>Grammar</td>
<td></td>
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<tr>
<td>Identify and explain</td>
<td>What makes vibrations and how sound (vibration) was made.</td>
<td>• The_____ feels like_____.</td>
<td>Movement, sound, motion / buzzing, shaking, ticklish, vibrating</td>
<td>Nouns, verbs, and adjectives</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• When _____ is made, it is called____.</td>
<td>Sound, noise / vibration</td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>• I used a _____.</td>
<td>Marble, rubber band, ruler / plucked, yanked, pulled, snapped, dropped, banged, threw, rolled, hit, smashed, tapped, struck, desk, wall, floor, book, across the air, door,</td>
<td></td>
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<td></td>
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<td>• I_____ the_____.</td>
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<td>• I_____ the_____ against the_____.</td>
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<tr>
<td>Rank and describe</td>
<td>What makes sound louder and softer</td>
<td>Marble, rubber band, ruler/ plucked, yanked, pulled, snapped, dropped, banged, threw, rolled, hit, smashed, tapped, struck./ desk, wall, floor, book, across the air, door/ harder, stronger, Louder, has more, has less, movement, energy, force</td>
<td>Verbs, nouns, quantifiers and comparatives</td>
<td></td>
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<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
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<tr>
<td>• _______ is the quietest because I _______ and it _______.</td>
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<tr>
<td>• _______ is _______ than _______ because _______.</td>
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<tr>
<td>• _______ is ranked the loudest object because it _______.</td>
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</tr>
</tbody>
</table>

**Revised Lesson Plan**

**Lesson 1**

**Content Objectives:**

1. SWBAT identify the factors that affect the loudness of sound that is produced by vibrating objects.
2. SWBAT describe the relationship between loudness of sound and the size of the vibration.

**Language Objectives:**

1. SWBAT use vocabulary to discuss and write what vibration is and how it is caused.
2. SWBAT discuss and write what is done to make the noise, rank the noise (from loudest to quietest), and measure the loudness as compared to the standard sound.

**Science Concepts:** Sound is produced through vibrations of objects. Using a variety of materials, that will vibrate, can create sounds. Some softer objects do not vibrate and do not produce sounds. The loudness of the sound is affected by the amount of vibration which is affected by the force and/or distance the object has. The closer we are to a sound, the louder it sounds.

**Science Materials (1 for each students):** Rulers, Marbles, Rubber bands, Cups, Word/phrase
bank copies, Listening guide, Student guide sheet, Word wall, Exit slip, 1 Poster of word/phrase bank (for students proficiency level 3 or lower).

**Vocabulary:**

- sound
- vibration
- volume (loudness of sound)

**Inquiry:** In this inquiry, students will experiment with different materials to identify the relationship between volume (loudness of sound) and the size of the vibration. Students will make different noise makers and experiment with loudness and softness by producing vibrations. Students will find some objects that do not vibrate well. Students can make repeatable sounds with a stretched rubber band or with a ruler placed over a hard object. Students will make standard sounds by dropping a marble from different heights and gauge the loudness of other sounds against their standard. *Students will conduct these activities with a partner and/or group.

**Lesson 1**

**Procedures and Directions:**

**Pre-Task: 5min**
- Build vocabulary and background knowledge by giving them a listening guide that will introduce all the objects and keywords necessary to complete the task. (See page 11)
- The teacher will write the words on the transparency next to the pictures that are shown through the overhead projector.

**Task 1: 5min**
- Guide students through Task 1 together, as a whole class. The teacher will model task 1 first and ask students to follow. The teacher will prompt students with questions to discuss, with their partners, how sound is produced through vibrations.(see page 12)
  - The students will still be assigned to their partners (each pair will be assigned according to language proficiency level) to discuss and answer the questions prompted by the teacher. They will be given 2 min to discuss with partners and then be asked to share their discoveries to the whole class.
  - Each group will have a differentiated student guide sheets according to level of language proficiency. Students’ will be asked to read, follow the steps for the
experiment and record their findings (according to their level). (see student guide for task 1 on page 2).

Task 2: 10min
- Students will be given directions orally by the teacher as the teacher guides them through making each noisemaker.
  - The teacher will use gestures, repeated speech, slower pace and realia (objects being used: ruler, rubber band, marble) to guide them to make noisemakers with each object. This will be done step by step for those students at a lower language level: starting with the marble, then the rubber band and lastly the ruler.
  - Introduce them to the picture word wall and phrase/word chart (See page 10) and explain to students that this will be used as a reference guide if necessary, at any point in the lesson
  - After each student makes noise with the object, they will discuss how they made the noise with their partner (teacher will remind them to refer to the phrase/word chart for help (see page 10)).
  - Then each student will write in how they made their noisemakers to complete the chart (using the phrase/word chart and their partners as a guide).
  - Each group will have a differentiated student guide sheets according to level of language proficiency. Students’ will be asked to read, follow the steps for the experiment and record their findings (according to their level). (see student guide for task 2 on page 12).

Task 3: 5min
- The teacher will ask students to rank the noisemakers’ sounds from quietest to loudest.
- The teacher will prompt the students by showing the objects and asking questions like “Is the marble louder than the ruler?” Or “Is the rubber band louder than the ruler?”
- Each group will have a differentiated student guide sheets according to level of language proficiency. Students’ will be asked to read, follow the steps for the experiment and record their findings (according to their level). (see student guide for task 3 on page 12).

Task 4: 15min
- The teacher will model the next task first by dropping the marble 1 cm onto the table. The teacher will discuss with students that they will be listening to the change in loudness of sound that changes when the distance is changed. The teacher will use gestures, repetition, and a slower pace when modeling for students.
- The teacher will then take the students step by step, changing the distance, by dropping the marble 5 cm, and then 25 cm onto to the table (students will be measuring and listening for the change in loudness).
- The students will be asked to record next to each measurement if the sound got louder or quieter.
- The teacher will have set up a group to model for the students what they will be expected to do in groups for measuring and listening to the loudness of the noise using a different object.
- The teacher will then have students work with their partners to follow the same steps using the ruler instead. Students will make sound with the ruler following the same distance pattern as they did with the marble.
- The students will be asked to record their discoveries (louder or quieter) on the chart for each.
- Each group will have a differentiated student guide sheets according to level of language proficiency. Students’ will be asked to read, follow the steps for the experiment and record their findings (according to their level). (see student guide for task 1 on page 13).
Task 5: 3min

- The teacher will give students an exit slip to assess students on what affects loudness of sounds.
- Each group will have a differentiated student guide sheets according to level of language proficiency. Students’ will be asked to read, follow the steps for the experiment and record their findings (according to their level). (see page ).
### Students Guide
#### Phrase/Word Chart

<table>
<thead>
<tr>
<th>PHRASES</th>
<th>WORDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXPLAIN: Task 1</td>
<td>(1)Movement, sound, motion</td>
</tr>
<tr>
<td>• The (1)____ feels</td>
<td>(2)buzzing, shaking, ticklish,</td>
</tr>
<tr>
<td>like (2)____.</td>
<td>vibrating</td>
</tr>
<tr>
<td>• When (1)____ is made, it is called vibration.</td>
<td>(1)Sound, noise</td>
</tr>
<tr>
<td>*</td>
<td>********************************************</td>
</tr>
<tr>
<td>EXPERIMENT AND EXPLAIN: Task 2</td>
<td>**</td>
</tr>
<tr>
<td>• I used a ____ (1)____.</td>
<td>(1)</td>
</tr>
<tr>
<td>• I (2)____ the ____ (1)____.</td>
<td>Marble, (pic)</td>
</tr>
<tr>
<td>• I (2)____ the ____ (1)____ against the ____ (3)____.</td>
<td>Rubber Band, (pic)</td>
</tr>
<tr>
<td>*</td>
<td>Ruler (pic)</td>
</tr>
<tr>
<td>The ____ (1)____ is ____ (2)____</td>
<td>(2)plucked, yanked, pulled,</td>
</tr>
<tr>
<td>when I ____ (3)____ it 5 cm than</td>
<td>snapped, dropped, banged,</td>
</tr>
<tr>
<td>when I ____ (3)____ the ____ (1)____ 1 cm.</td>
<td>rolled, hit, struck,</td>
</tr>
<tr>
<td></td>
<td>(3)desk, wall, floor, book, across</td>
</tr>
<tr>
<td></td>
<td>the air, door</td>
</tr>
<tr>
<td></td>
<td>********************************************</td>
</tr>
<tr>
<td></td>
<td>(1)marble, rubber band,</td>
</tr>
<tr>
<td></td>
<td>ruler</td>
</tr>
<tr>
<td></td>
<td>(2) louder, quieter</td>
</tr>
<tr>
<td></td>
<td>dropped, banged</td>
</tr>
</tbody>
</table>
Making Louder Sounds
(Student Guide Sheet)

Name ____________________________ Date __________________

Task 2: 5min
Teacher Models (2nd): Hold the cup in front of your mouth. Speak into the cup and feel the cup. Try to say “Hubble bubble toil and trouble” or “Avada Kedavra”. Speak again and feel the front of your neck.

Turn and talk with your partner:
(Level 3-1 use phrase/word chart to complete sentence)
What does the movement of the cup feel like? ________________
What is the movement called when objects make sound? ________________

Task 2: 10min
(1) Choose 1 object (marble, rubber band, ruler) and make a noise with it.
(2) Describe to your partner how you made noise with each object (marble, rubber band, ruler).
(3) Use the phrase/word chart to fill out the graphic organizer. (For levels 3-1 only)

(Level 3 use short phrases and Level 2-1 use one or two words)

<table>
<thead>
<tr>
<th>Object Used:</th>
<th>What did you do to make the noise?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rubber Band</td>
<td></td>
</tr>
<tr>
<td>Ruler</td>
<td></td>
</tr>
<tr>
<td>Marble</td>
<td></td>
</tr>
</tbody>
</table>

Task 3: 5min
Direction List:
1. Make the same noise you made before.
2. Rank your noise-makers (rubber band, ruler, marble) from quietest to loudest.
3. Try to make the same amount of noise each time you use one object (rubber band, ruler, marble).
4. Create a visual to display your ranking. (Teacher will display on the walls around the room and have students do a gallery walk)

Quietest
1. ............................................................... 
2. ............................................................... 
3. ............................................................... 
4. ............................................................... 

Loudest
Student Guide Sheet

Task 4: 15min
Teacher will model this first one:
1. Drop the marble from 1cm onto the table. Listen to the loudness.
2. Work with a partner. Use the ruler to measure.
3. Drop your marble from 1cm onto the table. Listen to the loudness.
4. Drop your marble from 5cm onto the table. Listen to the loudness and record if the sound is louder or quieter than 1cm.
5. Drop your marble from 25cm onto the table. Listen to the loudness and record if the sound is louder or quieter than 5cm.
6. Notice that the loudness changes with distance.

Change the object
1. Work with a partner. Use the ruler to measure.
2. Use a ruler and start with 1 cm.
3. Bang your ruler from 5 cm onto the table and record if the sound is louder or quieter than 1 cm
4. Bang your ruler from 25 cm onto the table and record if the sound is louder or quieter than 5 cm.
5. Complete the table below.

(Level 3-1 use the phrase/word chart to complete chart)
(Level 3 use short phrases and Level 2-1 use only one or two words)

<table>
<thead>
<tr>
<th>Distance</th>
<th>Discovery of sound (Is it louder or quieter than 1 cm?)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dropped Marble:</td>
<td></td>
</tr>
<tr>
<td>Dropped 5cm</td>
<td></td>
</tr>
<tr>
<td>Dropped 25cm</td>
<td></td>
</tr>
<tr>
<td>Distance Banged Ruler:</td>
<td></td>
</tr>
<tr>
<td>Banged 1 cm</td>
<td></td>
</tr>
<tr>
<td>Banged 5 cm</td>
<td></td>
</tr>
<tr>
<td>Banged 25 cm</td>
<td></td>
</tr>
</tbody>
</table>
Exit Slip
Level 5/4

1. Does your sound maker (describe each one) get quieter when you move away from it? Why? _______________________________.

2. Does the ruler make different sounds when snapped? Why? _______________________________.

3. Explain what is happening on your ruler, marble and rubber band? _______________________________.

4. Explain what variables make sounds louder? _______________________________. 
Exit Slip
Level 3

**See the phrase/word chart for the related words.

1. Does your sound maker (describe each one) get quieter when you move away from it? Why?
   The _____ gets _______ when you move away from it because ____________________________________________.

2. Does the ruler make different sounds when snapped? Why?
   The _____ makes a _____ sound when snapped on a _______ because ____________________________________________.

3. Explain what is happening on your ruler, marble and rubber band?
   When the _____ is _____ the movement is called ________.
   When the _____ is _____ the movement is called ________.
   When the _____ is _____ the movement is called ________.

4. Explain what variables make sounds louder?
   _____, _____ and _____ makes the sound _______.

(Modified text & Check for Understanding (p.130)
(3min))
Exit Slip  
Level 2

1. Does your sound maker get quieter when you move away from it?  
   Yes  or  No?  
   Ruler  
   Marble  
   Rubber Band

2. Which one sounds louder? Put a check (✓) next to your answer.  
   A ruler snapped against a hard desk?  OR  A ruler snapped against a thick book?  
   [space]  [space]

3. Why?  
   Because of ... The color  OR  The vibration

4. What movement is happening on your ruler, marble and rubber band?  

5. Put a check (✓) next to what makes sound louder?  
   Vibration (how movement object makes)  
   Color (the color of the object)  
   Force (how hard you hit, snap, or bang)  
   Smell (different smelling objects)  
   Distance (how close or far)
Name: ___________________________   Date: ___________________________

Exit Slip
Level 1

1. Does your sound maker get quieter when you move away from it? Yes or No?
   Ruler _____
   Marble _____
   Rubber Band _____

2. (a) Which one sounds louder: Put a check (√)
       A ruler snapped against a hard desk? OR A ruler snapped against a thick book?
       _________

2. Movement = _________

3. Put a check (√) next to making sound louder:
   _____ Vibration (how movement object makes)
   _____ Color (the color of the object)
   _____ Force (how hard you hit, snap, or bang)
   _____ Smell (different smelling objects)
   ______ Distance (how close or far)
Narrative

I modified a mainstream 5th grade science lesson on sound by implementing sheltered ELL strategies, adjusted discourse and enhanced interaction. I used a variety of strategies to contextualize the lesson, make student talk comprehensible, provide opportunities for output, give students a voice and engage at appropriate language proficiency levels. I began by implementing a listening guide to build background knowledge and to create a shared history with the words that were going to be used throughout the lesson. During the quick listening guide activity, the teacher will use gestures, realia, visuals, repetition and slower speech to make the content comprehensible. Throughout this activity the teacher is also modeling language that is expected and necessary to be used and learned by the end of the unit. Following this is the first task where the teacher models by using gestures and manipulatives (realia) to demonstrate what she wants students to do. The teacher creates the opportunity for students to talk and express what they are feeling and use language to describe their discovery about sound. During these tasks, the students are given talk time to give their explanations of how noises were made and how they would rank the noise/sound from quietest to loudest. The teacher provides student talk time with a partner by asking open-ended questions in order to allow students to negotiate meaning and use the language that is expected to be learned. The teacher also provides a phrase/word chart to give students the sentence starters and the vocabulary or key words to complete there thoughts. Throughout the lesson the teacher uses lots of gestures to explain directions as well as pictures and realia when discussing the objects being used or the manner in which it is being used.

Graphic organizers, such as charts, are used to create an organized visual of the information being asked for as well as a source for students to locate necessary information. Before any of the tasks are given to the students, the teacher models for them what is expected of them in order to complete the task. This, in turn, allows the students a visual and a guide for them to complete the assignments. The teacher also uses an actual group of students to model for the class what is expected within the group. The teacher will modify the speed of his/her speech and use repetition
to make sure that the content of what is discussed is comprehended. The teacher provides a check for understanding at the end of her lesson to informally evaluate if the objectives have been met and if there are any factors that still need further practice and teaching to be done. The exit slip was modified by framing the ideas that are being asked and making the content comprehensible to answer. The questions also vary in possible ways to answer as far as: multiple choice or classifying which requires students to critically think. However it also allows them to respond with enough information that gives the teacher a clear evaluation of what they learned. The teacher has also provided a homework assignment that will give students practice, allow them to think critically and will provide another set of data to evaluate students’ comprehension on the content. All of these sheltered strategies, adjusted discourse, and enhanced interaction was used to help modify the lesson and meet the needs of all my students’ varying language proficiency levels.
Lesson 2
### Lesson 2
**Content Objectives:**

1. SWBAT demonstrate and describe the various levels of pitch.
2. SWBAT describe the relationship between the size, tension, tightness, and or speed of vibrating objects and pitch.

**Language Objectives:**

1. SWBAT use gestures and appropriate vocabulary to explain how high and low pitch sounds are made with and/or specific variables.
2. SWBAT write and display the varying sounds of pitch (highest to lowest) made by different lengths, tension, tightness and speed of vibration of specific objects.

<table>
<thead>
<tr>
<th>Domain/Topic</th>
<th>Level 5</th>
<th>Level 4</th>
<th>Level 3</th>
<th>Level 2</th>
<th>Level 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speaking /Listening: High and low pitch sounds</td>
<td>Students will lead a group discussion by using appropriate vocabulary, in complete detailed sentences, and to gestures to explain what makes high and low pitch sounds.</td>
<td>Students will participate in a small group discussion by using appropriate vocabulary, in short phrases and gestures to explain what makes high and low pitch sounds.</td>
<td>Students will participate in a small group discussion by including appropriate vocabulary to complete sentence starters and gestures to explain what makes high and low pitch sounds.</td>
<td>Students will participate in a small group discussion by using 1 or words given, vocabulary, from the word bank to complete sentence frames and gestures to explain what makes high and low pitch sounds.</td>
<td>Students will participate in small group discussion by matching pictures, circling appropriate vocabulary, repeating given vocabulary and using gestures to explain what makes high and low pitch sounds.</td>
</tr>
<tr>
<td>Reading/Writing:</td>
<td>In a small group, students will use content related vocabulary to write complete sentences to explain the observations made and the results found in their experiments with pitch: *Speed of vibration *Length of objects *Tension</td>
<td>In a small group, students will use content related vocabulary to write short phrases to explain the observations made and the results found in their experiments with pitch: *Speed of vibration *Length of objects *Tension</td>
<td>With a partner, students will use content related vocabulary in the word bank to complete sentence frames and explain the observations made and the results found in their experiments with pitch: *Speed of vibration *Length of objects *Tension</td>
<td>With a partner, students will write 1 or 2 from the word bank to complete sentence frames and explain the observations made and the results found in their experiments with pitch: *Speed of vibration *Length of objects *Tension</td>
<td>One on one with the teacher or with a partner, students can use their L1, pictures, word bank to circle, repeat, or match to explain the observations made and the results found in their experiments with pitch: *Speed of vibration *Length of objects *Tension</td>
</tr>
</tbody>
</table>

**Science Concepts:** Pitch is the property of sound that ranges from high, squeaky, tinny sounds at one end to low, deep, bass, sounds at the other. Small, short, and tightly stretched objects make higher pitched sounds than larger, and less tightly stretched objects. Changing the lengths of a string changes the pitch, longer makes it deeper, shorter makes it higher. Changing the tension of a string changes the pitch, higher tension, the higher the pitch, lower tension the lower the pitch.

**Science Materials (1 for each student):** Three ring binder, ruler, rubber bands, narrow straws and wider straws, word/phrase chart copies, listening guide, students guide sheets, exit slips, 1 poster of word bank (especially for students language proficiency level 3 or lower)

**Vocabulary:** Vibration, Pitch, Length, Tension

**Inquiry:** In this inquiry, students will explore how the pitch of similar objects is related to their size. They will also change the pitch of sound by changing the size and the tension or tightness of objects.
<table>
<thead>
<tr>
<th>Function</th>
<th>Situation</th>
<th>Expression</th>
<th>Words/Phrases</th>
<th>Grammar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rank and explain</td>
<td>What object or length of object makes a higher or lower pitch?</td>
<td>• The _____ sound makes a _____ pitch.</td>
<td>Pig, dog, bird, mouse, cow, cat/ High, low</td>
<td>Nouns, verbs, adjectives and comparatives</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The _____ makes a _____ pitch, than the ______.</td>
<td>Pig, dog, bird, mouse, cow, cat/ Higher, lower/</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The _____ the _____ the _____ the pitch is.</td>
<td>Pig, dog, bird, mouse, cow, cat</td>
<td></td>
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<td></td>
<td></td>
<td>• The _____ the ruler is hanging off the desk the vibration is __________.</td>
<td>Longer, shorter/ Ruler, straw, rubber band/ Higher, lower</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The _____ the ruler is hanging off the desk the _____ the pitch of sound is.</td>
<td>Slow, faster</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Longer, shorter/</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Higher, lower</td>
<td></td>
</tr>
<tr>
<td>Identify and explain</td>
<td>What conclusion was made after experimenting?</td>
<td>Ruler, straw, rubber band/ Long, shorter/ Tapping, hitting, blowing, plucking/ Higher, lower</td>
<td>Verbs, nouns, comparatives and adverbs,</td>
<td></td>
</tr>
<tr>
<td>----------------------</td>
<td>---------------------------------------------</td>
<td>--------------------------------------------------------------------------------</td>
<td>--------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• When the _____ is _____ from ______ it, the pitch is ______.</td>
<td>Table, desk, counter/ Higher, lower</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• The length of the ruler off the _____ makes the pitch of sound ____.</td>
<td>Speed of vibration, tension, tightness, size, length/ Changes, differs, varies/ High, low</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• When the ____ of objects changes, the pitch _____ from _____ to ______.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Lesson 2
Procedures and Directions:
Pre-task: 5 min
- Build vocabulary and background knowledge by starting with a listening guide that will introduce all objects and keywords necessary to complete each task. (see page 30).
- The teacher will write words on a transparency next to the pictures that are shown on the listening guide (on the transparency) through an overhead projector.

Task 1: 10 min
- Teacher will guide students through the first task in a whole class set up. The teacher will model the task first through visuals (chart), manipulative (ruler) and gestures and ask students to then follow the same procedure by reading directions and following the steps given.
  - Teacher places a ruler across the edge of the desk so that a certain length hangs off the table. Start with 15 cm of the ruler hanging off the desk. (As the teacher models, he/she uses gestures and orally discusses the process she/he is taking.)
  - He/she taps the edge of the ruler and notes the vibration’s speed and pitch. He/she records the findings in the chart and tells students to use her first recording as an example to continue to complete the chart.
  - Each group will have a differentiated student guide sheets according to level of language proficiency. Students’ will be assigned a group or partner to work with. Students’ will be asked to read, follow the steps for the experiment and record their findings (according to their level). (see student guide for task 1 on page 31-30).

Task 2: 10 min
- Teacher will model by holding up a narrow straw and a wide straw and shows the students that they can slide it in and out the other straw. He/she will put the straw in and blow across the end of the straw and listen to the pitch of sound.
  - The teacher starts with a short piece of straw out and tells students to change the length of the straw that is out. She/he will tell the students to listen to the change in pitch as they slide the narrow straw out (longer) of the wide straw.
  - Each group will have a differentiated student guide sheets according to level of language proficiency. Students’ will be asked to read, follow the steps for the experiment and record their findings (according to their level). (see student guide for task 2 on page 31-35).

Task 3: 10 min
- Teacher will model first by showing students a binder, a rubber band and a ruler. She/he will then put the rubber band around the closed binder. She/he will slide a ruler under the rubber band and turn the ruler sideways to make the rubber band tight.
  - The teacher will then pluck the rubber band and move the ruler to see how to change the length of the rubber band being plucked which changes the sound.
  - Each group will have a differentiated student guide sheets according to level of language proficiency. Students’ will be asked to read, follow the steps for the
ruler band and turn the ruler sideways to make the rubber band tight.

- The teacher will then pluck the rubber band and move the ruler to see how to change the length of the rubber band being plucked which changes the sound.
- Each group will have a differentiated student guide sheets according to level of language proficiency. Students’ will be asked to read, follow the steps for the experiment and record their findings what they find after plucking the band and moving the ruler (according to their level). (see student guide for task 3 on page ).

Task 4: 5min

- The teacher will give students an exit slit to assess students on what effects the change in the pitch of sound. Each student will have a differentiated exit slip according to level of language proficiency. (see page ).
- Each student will have a differentiated exit slip according to level of language proficiency. (see page )
Name_________________________  Date_________________________

Listening Guide

Write \( p \)

Pitch (\( n \)) → High or Low

_________________________

_________________________

_________________________

_________________________

_________________________

_________________________
Vibrations and Pitch
(Students Guide Sheet)

Teacher Models First: Teacher places a ruler across the edge of the desk so that a certain length hangs off the table. Start with 15 cm of the ruler hanging off the desk. (As the teacher models, he/she uses gestures and orally discusses the process she/he is taking.)

Steps:
1. Hold the ruler flat on the table with the palm of your hand.
2. Tap the edge of the ruler.
3. Write down if the vibration is fast or slow.
4. Write down of the pitch is high or low.
5. Repeat the steps 1-4 with less of the ruler off the desk.
6. Discuss with group members your findings.

<table>
<thead>
<tr>
<th>Lengths off the desk</th>
<th>What did you notice about the speed of the vibrations?</th>
<th>What did you notice about</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 cm</td>
<td>Longer rulers vibrate more slowly</td>
<td>Longer rulers make lower pitch sounds</td>
</tr>
<tr>
<td>cm</td>
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<td></td>
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<tr>
<td>cm</td>
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<td>cm</td>
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<tr>
<td>cm</td>
<td></td>
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</tr>
</tbody>
</table>
**Teacher Models first:** Teacher places a ruler across the edge of the desk so that a certain length hangs off the table. Start with 15 cm of the ruler hanging off the desk. (As the teacher models, he/she uses gestures and orally discusses the process she/he is taking.)

**Steps:**
1. Hold the ruler flat on the table with the palm of your hand.
2. Tap the edge of the ruler.
3. Write down if the vibration is fast or slow.
4. Write down of the pitch is high or low.
5. Repeat the steps 1-4 with less of the ruler off the desk.
6. Discuss with group members your findings.

<table>
<thead>
<tr>
<th>Lengths off the desk</th>
<th>What did you notice about the speed of the vibrations?</th>
<th>What did you notice about pitch sounds?</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 cm</td>
<td>Longer rulers vibrate more slowly</td>
<td>Longer rulers make lower pitch sounds.</td>
</tr>
<tr>
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<tr>
<td>10 cm</td>
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<tr>
<td>5 cm</td>
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<tr>
<td>3 cm</td>
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<td></td>
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</tbody>
</table>
Vibrations and Pitch
(Student's Guide Sheet)

Teacher Models first: Teacher places a ruler across the edge of the desk so that a certain length hangs off the table. Start with 15 cm of the ruler hanging off the desk. (As the teacher models, he/she uses gestures and orally discusses the process she/he is taking.)

Steps:
1. Hold the ruler flat on the table with the palm of your hand.
2. Tap the edge of the ruler.
3. Circle ← if the vibration is faster or slower.
4. Circle → the pitch if it is higher or lower.
5. Repeat the steps 1-4 with less of the ruler off the desk.
6. Discuss with group members your findings.

<table>
<thead>
<tr>
<th>Lengths off the desk</th>
<th>Circle the vibration that matches:</th>
<th>Circle the pitch that matches:</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 cm</td>
<td>Vibration</td>
<td>High pitch (or) Low pitch</td>
</tr>
<tr>
<td></td>
<td>Slower (or) Faster</td>
<td></td>
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</tbody>
</table>
(Modified original lesson)
(Level 5&4)
Task 2: 5 min

Name: ___________________________ Date: ___________________________

Making High/Low Pitch of sound "Using straws"
(Student's Guide Sheet)

Teacher Models First: Teacher holds up a narrow straw and a wide straw and shows the students that they can slide it in and out the other straw. He/she will put the straw in and blow across the end of the straw and listen to the pitch of sound. The teacher starts with a short piece of straw out and tells students to change the length of the straw that is out. She/he will tell the students to listen to the change in pitch as they slide the narrow straw out (longer) of the wide straw. She/he will tell students to follow the steps and record their findings.

Steps:

1. Slide the narrow straw into the wide straw.
2. Leave some of the straw out.
3. Blow across the edge of the narrow straw and listen for the pitch.
4. Do steps 1-3 again and try leaving different lengths of straw out.
5. Write what you found and discuss with group members.

What did you find when you tried blowing across the edge?

__________________________
Task 2: 5 min
Name: ___________________________ Date: ___________________________

Making High/Low
Pitch of sound
"Using straws"
(Student’s Guide Sheet)

Teacher Models first: Teacher holds up a narrow straw and a wide straw and shows the students that they can slide it in and out the other straw. He/she will put the straw in and blow across the end of the straw and listen to the pitch of sound. The teacher starts with a short piece of straw out and tells students to change the length of the straw that is out. She/he will tell the students to listen to the change in pitch as they slide the narrow straw out (longer) of the wide straw. She/he will tell students to follow the steps and record their findings.

Steps:
1. Slide the narrow straw into the wide straw.
2. Leave some of the straw out.
3. Blow across the edge of the narrow straw and listen for the pitch.
4. Do steps 1-3 again and try leaving different lengths of straw out.
5. Write what you found and discuss with partner.

What did you find when you tried blowing across the edge?
When I blew across the edge, I found that the _______ the _____ was out, the_______ the _____ was. So, when the _______ the _____ was out, the _______ the _______ was.

<table>
<thead>
<tr>
<th>Word Bank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Longer</td>
</tr>
</tbody>
</table>
(Modified original lesson)

(Level 2)

Task 2: 5 min

Name: ___________________________   Date: ___________________________

Making High/Low
Pitch of sound
"Using straws"
(Student's Guide Sheet)

**Teacher Models first:** Teacher holds up a narrow straw and a wide straw and shows the students that they can slide it in and out of the other straw. He/she will put the straw in and blow across the end of the straw and listen to the pitch of sound. The teacher starts with a short piece of straw out and tells students to change the length of the straw that is out. She/he will tell the students to listen to the change in pitch as they slide the narrow straw out (longer) of the wide straw. She/he will tell students to follow the steps and record their findings.

**Steps:**
1. Slide the narrow straw into the wide straw.
2. Leave some of the straw out.
3. Blow across the edge of the narrow straw and listen for the pitch.
4. Do steps 1-3 again and try leaving different lengths of straw out.
5. Write what you found and discuss with partner.

**What did you find when you tried blowing across the edge?**

When I blew across the edge, I found that the ______ (1) ______ the ______ (2) ______ was out, the ______ (3) ______ the ______ (4) ______ was. So, when the ______ (1) ______ the ______ (2) ______ was out, the ______ (3) ______ the ______ (4) ______ was.

<table>
<thead>
<tr>
<th>Word Bank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Longer</td>
</tr>
<tr>
<td>(1)</td>
</tr>
</tbody>
</table>
(Modified original lesson)

(Level 1)
Task 2: 5 min

Name: ________________________ Date: ________________________

Making High/Low
Pitch of sound
"Using straws"
(Student’s Guide Sheet)

Teacher Models first: Teacher holds up a narrow straw and a wide straw and shows the students that they can slide it in and out the other straw. He/she will put the straw in and blow across the end of the straw and listen to the pitch of sound. The teacher starts with a short piece of straw out and tells students to change the length of the straw that is out. She/he will tell the students to listen to the change in pitch as they slide the narrow straw out (longer) of the wide straw. She/he will tell students to follow the steps and record their findings.
Steps:
1. Slide the narrow straw into the wide straw.
2. Leave some of the straw out.
3. Blow across the edge of the narrow straw and listen for the pitch.
4. Do steps 1-3 again and try leaving different lengths of straw out.
5. Write what you found and discuss with partner.

What did you find when you tried blowing across the edge?

- Longer straw out → Higher (or) Lower pitch
- Shorter straw out → Higher (or) Lower pitch
(Modified original lesson)

(Level 5&4)

Task 3: 5 min

Name: ___________________________ Date: ___________________________

Making High/Low
Pitch of sound
(Student's Guide Sheet)

cont' on next page
**Teacher Models first:** Teacher will show students a binder and a rubber band. She/he will then put the rubber band around the closed binder. She/he will slide a ruler under the rubber band and turn the ruler sideways to make the rubber band tight. The teacher will then pluck the rubber band and move the ruler to see how to change it to change the sound. The teacher will then ask students to follow the steps to try it themselves and record what they find after plucking the band and moving the ruler.

**Steps:**
1. Put the rubber band around the closed binder.
2. Slide a ruler under the rubber band and turn the ruler sideways to make the rubber band tight.
3. Pluck the rubber band
4. Move the ruler to see how to change the sound.
5. Write what you find and discuss with partner.

**Describe one way to make the pitch higher.**

**Keeping the length the same, find another way to change the pitch. Describe how you can make the pitch go higher using this way.**
(Modified original lesson)

(Light 3)

Task 3: 5 min

Name: __________________________  Date: __________________________

Making High/Low
Pitch of sound
(Student's Guide Sheet)

Teacher Models First: Teacher will show students a binder and a rubber band. She/he will then put the rubber band around the closed binder. She/he will slide a ruler under the rubber band and turn the ruler sideways to make the rubber band tight. The teacher will then pluck the rubber band and move the ruler to see how to change it to change the sound. The teacher will then ask students to follow the steps to try it themselves and record what they find after plucking the band and moving the ruler.

Steps:

(cont' on next page)
1. Put the rubber band around the closed binder.
2. Slide a ruler under the rubber band and turn the ruler sideways to make the rubber band tight.
3. Pluck the rubber band
4. Move the ruler to see how to change the sound.
5. Write what you find and discuss with partner.

Describe one way to make the pitch higher.

One way to make the ______ higher is by___________it and making the ______ have more ________.

Keeping the length the same, find another way to change the pitch. Describe how you can make the pitch go higher using this way.

By ______ the ____________, I made the _______ ________. So, the _______
the ____________ is, the __________ the __________ is and the ______ the ______
is, the __________ the ______ is.

<table>
<thead>
<tr>
<th>Word Bank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Longer</td>
</tr>
<tr>
<td>tension</td>
</tr>
</tbody>
</table>


(Modified original lesson)

(Level 2)
Task 3: 5 min
Name:__________________________

Date:__________________________

Making High/Low
Pitch of sound
(Student's Guide Sheet)

cont' on next page
**Teacher Models First:** Teacher will show students a binder and a rubber band. She/he will then put the rubber band around the closed binder. She/he will slide a ruler under the rubber band and turn the ruler sideways to make the rubber band tight. The teacher will then pluck the rubber band and move the ruler to see how to change it to change the sound. The teacher will then ask students to follow the steps to try it themselves and record what they find after plucking the band and moving the ruler.

**Steps:**
1. Put the rubber band around the closed binder.
2. Slide a ruler under the rubber band and turn the ruler sideways to make the rubber band tight.
3. Pluck the rubber band
4. Move the ruler to see how to change the sound.
5. Write what you find and discuss with partner.

**Describe one way to make the pitch higher.**

One way to make the \((1)\) higher is by \((6)\) the \((7)\) and making the \((8)\) \((9)\).

Keeping the length the same, find another way to change the pitch. Describe how you can make the pitch go higher using this way.

By \((2)\) the \((5)\), it made the \((4)\) \((3)\). So, the \((3)\) the \((5)\) is, the \((10)\) the \((1)\) is and the more \((8)\) the \((5)\) has, the \((11)\) the \((1)\) is.
(Modified original lesson)

(Lesson 1)

Task: 5 min
Name: ____________________________ Date: ____________________________

Making High/Low
Pitch of sound
(Student’s Guide Sheet)

Teacher Models First: Teacher will show students a binder and a rubber band. She/he will then put the rubber band around the closed binder. She/he will slide a ruler under the rubber band and turn the ruler sideways to make the rubber band tight. The teacher will then pluck the rubber band and move the ruler to see how to change it to change the sound. The teacher will then ask students to follow the steps to try it themselves and record what they find after plucking the band and moving the ruler.

Steps:
1. Put the rubber band around the closed binder.
2. Slide a ruler under the rubber band and turn the ruler sideways to make the rubber band tight.
3. Pluck the rubber band
4. Move the ruler to see how to change the sound.
5. Write what you find and discuss with partner.

---

Does longer length? =

Higher 

Pitch (or) Lower

Does shorter length? =

Pitch

More tension? =

Higher (or) Lower

---
Exit Slip
(Level 4+5)

1) If a wire is cut into 4 different pieces and 4 different lengths and all the pieces were stretched to the same tightness, write which piece would give the lowest pitch? Why?

a) 

b) 

c) 

d) 

Explain: __________________________________________
__________________________________________
__________________________________________
__________________________________________
__________________________________________
Exit Slip
(Level 3)

1) If a wire is cut into 4 different length pieces and all the pieces were stretched to the same tightness. Write which piece would give the lowest pitch? Why?

   a.)

   b.)

   c.)

   d.)

   Explain: I chose ___ because I learned that if the ____________is ______it makes a_______ pitch sound.

   Use word/phrase chart to complete the sentence

<table>
<thead>
<tr>
<th>Word/Phrase Chart</th>
</tr>
</thead>
<tbody>
<tr>
<td>A ** B ** C ** D ** wire ** longer ** shorter</td>
</tr>
<tr>
<td>** lower ** higher</td>
</tr>
</tbody>
</table>
Exit Slip
(Level 2)

1. If a wire is cut into 4 different length pieces and all the pieces were stretched to the same tightness. Write which piece would give the lowest pitch? Why?

a.)

b.)

c.)

d.)

Explain: The (1) that is (2) makes a (3) pitch sound

(Use the picture word chart to complete the sentence)

<table>
<thead>
<tr>
<th>Picture/Word Chart</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Picture of wire and arrows]</td>
</tr>
<tr>
<td>Wire = (1)</td>
</tr>
<tr>
<td>Longer = (2)</td>
</tr>
<tr>
<td>Higher = (3)</td>
</tr>
</tbody>
</table>
Exit Slip  
(Level 1)

1.) If a wire is cut into 4 different length pieces and all the pieces were stretched to the same tightness.

* Write low pitch (or) high pitch on the line.

a.) □ □ □ □ → ____________

b.) □ □ → ______________

c.) □ □ → ______________

d.) ——— ——— → ____________

Word Bank

<table>
<thead>
<tr>
<th>High Pitch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Pitch</td>
</tr>
</tbody>
</table>
I modified my second lesson on the causes and variations of pitch by implementing ELL strategies, adjusted discourse and enhanced interaction. I used a variety of strategies to contextualize the lesson, focusing on meaning, making “talk” comprehensible, provide opportunities for output, give students a voice in their own learning and allow them to engage in appropriate activities differentiated by language proficiency levels. I began my lesson by building background knowledge and creating a shared history to develop vocabulary and keywords that would be introduced throughout the lesson. This was done through listening guides and the teacher modeling for students what is expected and how they are to follow the steps needed to conduct the experiments. During this modeling the teacher uses gestures, realia, like using actual straws for the straw experiment, slower speech, repeating certain phrases and keywords to make content more comprehensible. Throughout this activity the teacher models the language that is expected for students to learn, use and practice. This language model was presented to students orally, visually, non-linguistically and written not only to assure that all learning needs are met but also to model the various ways that the students themselves will be explaining their findings after experimenting. Throughout all tasks the lessons begin with the teacher modeling the process and then proceeds to allow students to work within groups or pairs to create opportunities to negotiate meaning, elicit student talk and practice instructional conversation. Students are expected to discuss and explain their findings to group members or partner after writing down their ideas. The student guide activities are differentiated according to language proficiency levels where the teacher has modified the written text to make it
uses word banks and provides a listening guide to give students a reference point to refer back to and/or use to complete the assignments. The teacher also provides sentence starters and frames the main ideas to make the content and big idea comprehensible. At the end of the lesson the teacher gives students an exit slip to check for understanding and assess students reaching the objectives therefore indicating any further need of re-teaching or reviewing the concepts introduced. The teacher also provides students with review and practice by giving a homework assignment which can also be used as a tool for informal assessment. Both assessment tools have been modified and differentiate to meet the needs of the students at their language proficiency level. All of the sheltered strategies, adjusted discourse and enhanced interaction were used to modify an original mainstream lesson in order to meet the needs of all the varying language levels students come with.
Lesson 3
### Lesson 3

**Content Objectives:**

1. SWBAT analyze, compare and contrast how sound is transmitted, reflected and/or absorbed by different variables.

**Language Objectives:**

1. SWBAT use oral and written language to describe what they categorized, manipulated and arranged to differentiate how the variables reflect, absorb, and/or transmit sound.

<table>
<thead>
<tr>
<th>Domain/Topic</th>
<th>Level 5</th>
<th>Level 4</th>
<th>Level 3</th>
<th>Level 2</th>
<th>Level 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speaking /Listening:</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Sound transmission, reflection and absorption</td>
<td>Students will lead a group discussion by using appropriate vocabulary, in complete detailed sentences to explain what was categorized, manipulated and/or arranged to display how different variables reflect, absorb, and/or transmit</td>
<td>Students will participate in a small group discussion by using appropriate vocabulary, in short phrases to explain what was categorized, manipulated and/or arranged to display how different variables reflect, absorb, and/or transmit</td>
<td>Students will participate in a small group discussion by including appropriate vocabulary to complete sentence starters to explain what was categorized, manipulated and/or arranged to display how different variables reflect, absorb, and/or transmit</td>
<td>Students will participate in a small group discussion by using 1 or 2 words given and vocabulary from the word bank to complete sentence frames to explain what was categorized, manipulated and/or arranged to display how different variables reflect, absorb, and/or transmit</td>
<td>Students will participate in small group discussion by matching pictures, circling appropriate vocabulary, repeating given vocabulary to explain what was categorized, manipulated and/or arranged to display how different variables</td>
</tr>
<tr>
<td>Reading/Writing:</td>
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<tr>
<td>Visually displaying how sound is transmitted, reflected, and absorbed.</td>
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<tr>
<td>In a small group, students will use content related vocabulary to write complete sentences to complete a visual that demonstrates the categories made, arrangements from loudest to quietest made and the different variables that transmit, reflect, and absorb sound.</td>
<td></td>
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</tr>
<tr>
<td>In a small group, students will use content related vocabulary to write short phrases to complete a visual that demonstrates the categories made, arrangements from loudest to quietest made and the different variables that transmit, reflect, and absorb sound.</td>
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</tr>
<tr>
<td>With a partner, students will use content related vocabulary from the word bank to complete sentence starters to complete a visual that demonstrates the categories made, arrangements from loudest to quietest made and the different variables that transmit, reflect, and absorb sound.</td>
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</tr>
<tr>
<td>With a partner, students will write 1 or 2 from the word bank to complete sentence frames to complete a visual that demonstrates the categories made, arrangements from loudest to quietest made and the different variables that transmit, reflect, and absorb sound.</td>
<td></td>
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</tr>
<tr>
<td>One on one with the teacher or with a partner, students can use their L1, pictures, word bank to circle, repeat, or match to complete a visual that demonstrates the categories made, arrangements from loudest to quietest made and the different variables that transmit, reflect, and absorb sound.</td>
<td></td>
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</tr>
<tr>
<td>Function</td>
<td>Situation</td>
<td>Expression</td>
<td>Words/Phrases</td>
<td>Grammar</td>
<td></td>
</tr>
<tr>
<td>-------------------------------</td>
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</tr>
</tbody>
</table>
| Rank, compare/contrast and explain | What materials transmit, absorb, and/or reflect sound? | • The _____ the material is the _____ sound it transmits.  
• The _____ is a _____ material so the sound is _____ because it transmits _____ sound.  
• The sound is _____ with an ear plug that is _____.
• The sound is absorbed _____ when the ear plug is ______. | Harder, softer/More, less  
Ruler, metal strip, cardboard, string/  
Hard, soft/Louder, quieter/  
More, less  
Louder, quieter/Expanded, relaxed  
More, less/  
Relaxed expanded, squeezed tight | Nouns, verbs, adjectives, comparatives and quantifiers |
<table>
<thead>
<tr>
<th>Identify, Compare/Contrast and Describe</th>
<th>What materials are found in a quiet room vs. a loud room?</th>
<th>Verbs, nouns, comparatives and adverbs,</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>•</strong> In a ______room ______materials are found.</td>
<td><strong>Quiet, loud/ Hard, soft/</strong></td>
<td>Reflects, bounces/ Hard, flat/</td>
</tr>
<tr>
<td><strong>•</strong> Sound ______ off of ______ materials which makes a____ sound than a____ material.</td>
<td>Louder, higher/ Soft, open</td>
<td>Goes inside, absorbs/ Soft, open/</td>
</tr>
<tr>
<td><strong>•</strong> Sound_______ through <strong><strong><strong>material which makes</strong></strong></strong>_ sound than a_______ materials.</td>
<td>Quieter, softer</td>
<td>Hard, flat</td>
</tr>
</tbody>
</table>

**Science Concepts:** Sound is reflected when sound strikes a different material than the one it is traveling through. When the sound is reflected the sound can be heard louder. Sound energy that is not reflected is either transmitted through the second material or it is absorbed and turned into small amounts of heat. Soft materials absorb a lot of sound. Hard materials reflect a lot of sound. Many materials, especially air, transmit sound energy well.

**Science Materials (1 for each student):** ticking timer, samples of various materials including: ear plugs, square of carpet padding, plastic cups, metal strip, plastic ruler, card board, string

**Vocabulary:** transmission, reflection, absorption

**Inquiry:** In this inquiry, students will investigate how sound travels through different materials. Students will rank materials by their ability to transmit sounds. They will decide which materials are better at absorbing, transmitting and reflecting sound.
Lesson 3
Procedures and Directions:

Pre-task: 5 min
- Build vocabulary and background knowledge by introducing all the objects and keywords necessary to complete the task.
- The teacher will have the words on index cards and pictures on a separate card. The teacher will play a quick game of matching the word with the card through oral, visual representation and gestures.

Task 1: 10min
- The teacher models the first task for students:
  - The teacher places one piece of soft carpet padding on the table. She/he will place a ticking timer on its back on the mat and then put a plastic cup over his/her ear.
  - After that he/she will put a ruler so that it touches the cup and the timer and she will explain orally and with gestures that she/he is listening carefully.
  - The teacher will then ask students to follow the steps and use the different materials to hear which materials make the sound louder or quieter.
    - Each group will have a differentiated student guide sheets according to level of language proficiency. Students’ will be assigned a group or partner to work with. Students’ will be asked to read, follow the steps for the experiment and record their findings (according to their level). (see student guide for task 1 on pages ).

Task 2: 10min
- The teacher models first for the students:
  - The teacher holds a cup over his/her ear and holds a ruler so that touches the cup and the timer.
  - Then he/she pulls the cup off the ruler and places one of the soft ear plugs between the cup and ruler. She/ he listened to the sound that you hear.
  - The teacher tells the students to follow the steps and compare the sounds that you hear when they try it with and without the soft ear plug.
    - Each group will have a differentiated student guide sheets according to level of language proficiency. Students’ will be assigned a group or partner to work with. Students’ will be asked to read, follow the steps for the experiment and record their findings (according to their level). (see student guide for task 2 on pages ).

Task 3: 20min
- The teacher models first for the students:
  - The teacher will do a think aloud and orally think of a loud place.
  - She/he will then think of some hard and flat objects in that room.
  - The teacher will then ask students to work together and follow the steps to complete the categorization.
  - The teacher will supply materials: Construction paper, scissors, glue, fabric,
o The teacher will do a think aloud and orally think of a loud place.
 o She/he will then think of some hard and flat objects in that room.
 o The teacher will then ask students to work together and follow the steps to complete the categorization.
 o The teacher will supply materials: Construction paper, scissors, glue, fabric, magazines, markers, pencils and crayons.
 o Teacher will display visuals on the wall around the room and have a gallery walk to allow all groups to see other group’s student work.
   - Each group will have a differentiated student guide sheets according to level of language proficiency. Students’ will be assigned a group or partner to work with. Students’ will be asked to read, follow the steps for the experiment and record their findings (according to their level). (see student guide for task 3 on pages 63-65

**Task 4: 3min**

- The teacher will give students an exit slip to assess students on materials that are absorbed and understanding of the words: transmit, reflect, and absorb. (see page 66-69
- The teacher will also give a homework assignment to review information taught during the three tasks. (see page 70-73
(Modified original lesson)

(Level 5/4)

Task 1: 10 min

Teacher Models First: Teacher places one piece of soft carpet padding on the table. She/he will place a ticking timer on its back on the mat and then put a plastic cup over his/her ear. After that she/he will put a ruler so that it touches the cup and the timer and she will explain orally and with gestures that she/he is listening carefully. The teacher will then ask students to follow the steps and use the different materials to hear which materials make the sound louder or quieter. The teacher will model and explain that they will be looking at the material and rank the sound from loudest to quietest after the experiments are complete.

Steps:
1. Place a metal strip of the file hanger between the timer and the cup.
2. Place the cup on your ear.
3. Listen carefully.
4. Record the information in the chart to complete the experiment.
5. Do steps 1-4 using the other materials: card board and string.
6. After completing the chart → Which materials rank sound loudest to quietest?
7. Create a visual to display the rank → Be Creative!
8. Describe to your group members.

<table>
<thead>
<tr>
<th>Material</th>
<th>What does the material feel like?</th>
<th>Is the sound loud or soft?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ruler</td>
<td>hard</td>
<td>Loud</td>
</tr>
</tbody>
</table>

What did you find out about transmitted sounds?
(Modified original lesson)
(Level 3)

Task 1: 10 min

Teacher Models First: Teacher places one piece of soft carpet padding on the table. She/he will place a ticking timer on its back on the mat and then put a plastic cup over his/her ear. After that she/he will put a ruler so that it touches the cup and the timer and she will explain orally and with gestures that she/he is listening carefully. The teacher will then ask students to follow the steps and use the different materials to hear which materials make the sound louder or quieter. The teacher will model and explain that they will be looking at the material and rank the sound from loudest to quietest after the experiments are complete.

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<td>Hard</td>
<td>Loud</td>
</tr>
</tbody>
</table>

What did you find out about transmitted sounds?

Sounds are transmitted through____material and the sound is______. So, sounds are____if the material is_____.
(Modified original lesson)
(Level 2)
Task 1: 10 min
Teacher Models first: Teacher places one piece of soft carpet padding on the table. She/he will place a ticking timer on its back on the mat and then put a plastic cup over his/her ear. After that she/he will put a ruler so that it touches the cup and the timer and she will explain orally and with gestures that she/he is listening carefully. The teacher will then ask students to follow the steps and use the different materials to hear which materials make the sound louder or quieter. The teacher will model and explain that they will be looking at the material and rank the sound from loudest to quietest after the experiments are complete.

Steps:
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2. Place the cup on your ear.
3. Listen carefully.
4. Record the information in the chart to complete the experiment.
5. Do steps 1-4 using the other materials: card board and string.
6. After completing the chart → Which materials rank sound loudest to quietest?
7. Create a visual to display the rank→Be Creative!
8. Describe to your group members.

<table>
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<th>Material</th>
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<th>Is the sound Loud or Quiet?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ruler</td>
<td>Hard</td>
<td>Loud</td>
</tr>
<tr>
<td>Metal strip</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Card board</td>
<td></td>
<td></td>
</tr>
<tr>
<td>String</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

What did you find out about transmitted sounds?

Sounds are transmitted through _______ materials.
The sound is _______ if the material is _______.

Word Bank

<table>
<thead>
<tr>
<th>Hard</th>
<th>Loud</th>
<th>Soft</th>
<th>Quiet</th>
</tr>
</thead>
</table>
(Modified original lesson)
(Level 1)
Task 2: 10 min
Teacher Models first: Teacher places one piece of soft carpet padding on the table. She/he will place a ticking timer on its back on the mat and then put a plastic cup over his/her ear. After that she/he will put a ruler so that it touches the cup and the timer and she will explain orally and with gestures that she/he is listening carefully. The teacher will then ask students to follow the steps and use the different materials to hear which materials make the sound louder or quieter. The teacher will model and explain that they will be looking at the material and rank the sound from loudest to quietest after the experiments are complete.

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2. Place the cup on your ear.
3. Listen carefully.
4. Record the information in the chart to complete the experiment.
5. Do steps 1-4 using the other materials: card board and string.
6. After completing the chart → Which materials rank sound loudest to quietest?
7. Create a visual to display the rank → Be Creative!
8. Describe to your group members.

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<th>Is the sound Loud or Quiet?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ruler</td>
<td>Hard</td>
<td>Loud</td>
</tr>
<tr>
<td>Metal strip</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Card board</td>
<td></td>
<td></td>
</tr>
<tr>
<td>String</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

What did you find out about transmitted sounds?
1. Transmitted sound → **Hard (or) Soft**
2. Hard material transmits sound → **Loud (or) Quiet**
3. Soft material transmits sound → **Loud (or) Quiet**

<table>
<thead>
<tr>
<th>Word Bank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hard</td>
</tr>
<tr>
<td>Loud</td>
</tr>
<tr>
<td>Soft</td>
</tr>
<tr>
<td>Quiet</td>
</tr>
</tbody>
</table>
(Modified original lesson)
(Level 5/4)

Task 2: 5 min

Teacher Models First: The teacher holds a cup over his/her ear and holds a ruler so that it touches the cup and the timer. Then he/she pulls the cup off the ruler and places one of the soft ear plugs between the cup and ruler. She/he listened to the sound that you hear. The teacher tells the students to follow the steps and compare the sounds that you hear when they try it with and without the soft ear plug.

Steps:
1. Place the cup over your ear so that the ruler is touching the cup and the timer.
2. Place a soft ear plug in between the ruler and the cup.
3. Listen to the sound you hear.
4. Try it again without the ear plug.
5. Write down your observations.
6. Turn and talk to group members about what you heard and the comparison you made.

What happens when you have the ear plug in between the ruler and the cup?

What happens when you do not have the ear plug?

Now→ Teacher models again by showing how to squeeze the ear plug and shows them the ear plug when it's relaxed or expanded. Teacher tells them to try both ways and compare the sound they hear. Then turn and talk to discuss what you heard.

What is the difference between using the ear plug when it is squeezed tight and using when it is relaxed and expanded?
(Modified original lesson)
(Level 3)

Task 2: 5 min

Teacher Models first: The teacher holds a cup over his/her ear and holds a ruler so that touches the cup and the timer. Then he/she pulls the cup off the ruler and places one of the soft ear plugs between the cup and ruler. She/ he listened to the sound that you hear. The teacher tells the students to follow the steps and compare the sounds that you hear when they try it with and without the soft ear plug.

Steps:
1. Place the cup over your ear so that the ruler is touching the cup and the timer.
2. Place a soft ear plug in between the ruler and the cup.
3. Listen to the sound you hear.
4. Try it again without the ear plug.
5. Write down your observations.
6. Turn and talk to group members about what you heard and the comparison you made.

What happens when you have the ear plug in between the ruler and the cup?

The sound is ______ when the ______ is in between.

What happens when you do not have the ear plug?

The sound is ______ when the ______ is not in between.

Now→ Teacher models again by showing how to squeeze the ear plug and shows them the ear plug when it's relaxed or expanded. Teacher tells them to try both ways and compare the sound they hear. Then turn and talk to discuss what you heard.

What is the difference between using the ear plug when it is squeezed tight and using when it is relaxed and expanded?

The ______ that is ______ makes ______ sound.

The ______ that is ______ makes ______ sound.

The ______ sound is ______ when the ear plug is ______.

<table>
<thead>
<tr>
<th>Word Bank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ear plug</td>
</tr>
<tr>
<td>more</td>
</tr>
<tr>
<td>expanded</td>
</tr>
<tr>
<td>relaxed</td>
</tr>
<tr>
<td>less</td>
</tr>
<tr>
<td>squeezed</td>
</tr>
<tr>
<td>absorbed</td>
</tr>
</tbody>
</table>
Modified original lesson)
(Level 2)

**Task 2: 5 min**

**Teacher Models First:** The teacher holds a cup over his/her ear and holds a ruler so that touches the cup and the timer. Then he/she pulls the cup off the ruler and places one of the soft ear plugs between the cup and ruler. She/he listens to the sound that you hear. The teacher tells the students to follow the steps and compare the sounds that you hear when they try it with and without the soft ear plug.

**Steps:**
1. Place the cup over your ear so that the ruler is touching the cup and the timer.
2. Place a soft ear plug in between the ruler and the cup.
3. Listen to the sound you hear.
4. Try it again without the ear plug.
5. Write down your observations.
6. Turn and talk to group members about what you heard and the comparison you made.

**What happens when you have the ear plug in between the ruler and the cup?**

The sound is _______ when the ear plug is in between.  
(More (or) Less)

**What happens when you do not have the ear plug?**

The sound is _______ when the ear plug is not in between.  
(More (or) Less)

**Now→** Teacher models again by showing how to squeeze the ear plug and shows them the ear plug when it's relaxed or expanded. Teacher tells them to try both ways and compare the sound they hear. Then turn and talk to discuss what you heard.

**What is the difference between using the ear plug when it is squeezed tight and using when it is relaxed and expanded?**

The _______ that is _______ makes _____ sound.  
(expanded, ear plug, relaxed, more, less)

The _______ that is _______ makes _____ sound.  
(expanded, ear plug, relaxed, more, less)

The ear plug ______ more sound when the ear plug is _______.  
(squeezed, expanded, relaxed, absorbs)
Modified original lesson)
(Level 1)
Task 2: 5 min
Teacher Models First: The teacher holds a cup over his/her ear and holds a ruler so that touches the cup and the timer. Then he/she pulls the cup off the ruler and places one of the soft ear plugs between the cup and ruler. She/ he listened to the sound that you hear. The teacher tells the students to follow the steps and compare the sounds that you hear when they try it with and without the soft ear plug.
Steps:
1. Place the cup over your ear so that the ruler is touching the cup and the timer.
2. Place a soft ear plug in between the ruler and the cup.
3. Listen to the sound you hear.
4. Try it again without the ear plug.
5. Write down your observations.
6. Turn and talk to group members about what you heard and the comparison you made.

What happens when you have the ear plug in between the ruler and the cup?
Ear plug→ (More (or) Less)

What happens when you do not have the ear plug?
No ear plug→ (More (or) Less)

Now→ Teacher models again by showing how to squeeze the ear plug and shows them the ear plug when it's relaxed or expanded. Teacher tells them to try both ways and compare the sound they hear. Then turn and talk to discuss what you heard.

What is the difference between using the ear plug when it is squeezed tight and using when it is relaxed and expanded?
Expanded → ear plug → more (or) less sound
Squeezed → ear plug → more (or) less sound
Absorbs more sound → expanded or squeezed
(Modified original lesson)
(Level 5/4)

Task 3: 5 min

Teacher Models First: The teacher will do a think aloud and orally think of a loud place. She/he will then think of some hard and flat objects in that room. The teacher will then ask students to work together and follow the steps to complete the categorization. The teacher will supply materials: Construction paper, scissors, glue, fabric, magazines, markers, pencils and crayons.

Steps:
1. Think of a loud place and discuss with group members.
2. List some hard and flat objects that you would find in that room.
3. Think of a quiet and place discuss with group members.
4. List some hard and flat objects that you would find in that room.
5. Create a visual, using the materials given, to display the categories.

<table>
<thead>
<tr>
<th>Loud Room</th>
<th>Quiet Room</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Hard flat surfaced materials</td>
<td>• Soft open fabrics</td>
</tr>
<tr>
<td>•</td>
<td>•</td>
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</tbody>
</table>

What do you think happens when sound travels through the air and hits hard objects?

__________________________________________________________________________

What do you think happens when sound travels through the air and hits a soft object?

__________________________________________________________________________
(Modified original lesson)
(Level 3)

**Task 3: 5 min**

**Teacher Models First:** The teacher will do a think aloud and orally think of a loud place. She/he will then think of some hard and flat objects in that room. The teacher will then ask students to work together and follow the steps to complete the categorization. The teacher will supply materials: Construction paper, scissors, glue, fabric, magazines, markers, pencils and crayons.

**Steps:**
6. Think of a loud place and discuss with group members.
7. List some hard and flat objects that you would find in that room.
8. Think of a quiet place and discuss with group members.
9. List some hard and flat objects that you would find in that room.
10. Create a visual, using the materials given, to display the categories.

<table>
<thead>
<tr>
<th><strong>Loud Room</strong></th>
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</tr>
</tbody>
</table>

**What do you think happens when sound travels through the air and hits hard objects?**

When travels through air and hits objects, the sound off the object.

**What do you think happens when sound travels through the air and hits a soft object?**

When travels through air and hits objects, the sound off the object.

<table>
<thead>
<tr>
<th><strong>Word Bank</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>sound, hard, soft, reflects, bounces off, absorbs</td>
</tr>
</tbody>
</table>
(Modified original lesson)
(Level 2)
Task 3: 5 min

Teacher Models First: The teacher will do a think aloud and orally think of a loud place. She/he will then think of some hard and flat objects in that room. The teacher will then ask students to work together and follow the steps to complete the categorization. The teacher will supply materials: Construction paper, scissors, glue, fabric, magazines, markers, pencils and crayons.

Steps:
11. Think of a loud place and discuss with group members.
12. List some hard and flat objects that you would find in that room.
13. Think of a quiet place and discuss with group members.
14. List some hard and flat objects that you would find in that room.
15. Create a visual, using the materials given, to display the categories.

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</tbody>
</table>

What do you think happens when sound travels through the air and hits hard objects?

When _______ travels through air and hits _______ objects, the sound _______ off the object. (Sound, hard, reflects, bounces off)

What do you think happens when sound travels through the air and hits a soft object?

When _______ travels through air and hits _______ objects, the sound _______ off the object. (Sound, soft, absorbs)
Exit Slip
Level 4/5

1. List some materials that would most likely absorb sound?
   ____________ ____________ ____________ ____________

2. Write down the word that matches the following ideas:
   a. Bounces off ________________
   b. Goes through ________________
   c. Gets lost within ________________
3. List some materials that would most likely absorb sound?
   __________ __________ __________ __________

4. Write down the word that matches the following ideas:
   d. Bounces off ________________
   e. Goes through ________________
   f. Gets lost within ________________

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<tbody>
<tr>
<td>Sound</td>
</tr>
</tbody>
</table>

Exit Slip  
Level 2

5. List some materials that would most likely absorb sound:
   _______  _______  _______  _______

6. Write down the word that is matches the following ideas:

   g. Bounces off _________

   h. Goes through _________

   i. Gets lost within _________

<table>
<thead>
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<tr>
<td>soft curtain</td>
<td>door</td>
</tr>
<tr>
<td>window</td>
<td>stone wall</td>
</tr>
<tr>
<td>pillow</td>
<td></td>
</tr>
</tbody>
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<table>
<thead>
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</tr>
</thead>
<tbody>
<tr>
<td>reflects</td>
<td>bounces off</td>
</tr>
<tr>
<td>transmits</td>
<td>absorbs</td>
</tr>
</tbody>
</table>
Exit Slip
Level 1

7. List some materials that would most likely absorb sound?


8. Write down the word that is matches the following ideas:

j. Bounces off ___ reflects (or) absorbs ___

k. Goes through ___ reflects (or) transmits ___

l. Gets lost within ___ transmits (or) absorbs ___

Word Bank:
pictures
soft curtain
door
window
stone wall
pillow
1. What materials does sound travel through?

2. Which rooms are noisy and which rooms are quiet?

   a. Are the materials in the room different? Why or why not?
1. Which rooms are noisy and which rooms are quiet?
   Rooms that are _____ have _______ materials in them.
   Rooms that are _____ have _______ materials in them.

   a. Are the materials in the room different? Why or why not?
   _______ the materials are _________ because
   sound________ off of _________ objects.

<table>
<thead>
<tr>
<th>Word Bank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quiet      not different</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
1. Which rooms are noisy and which rooms are quiet?

Rooms that are noisy have _____ materials in them.  (hard, soft)
Rooms that are quiet have _____ materials in them.  (hard, soft)

A. Are the materials in the rooms different? Why or why not?

_______ the materials are _________ because sound_______
off of _________ objects.  (Yes, different, reflects, hard)
1. Which rooms are noisy and which rooms are quiet?

Rooms with **Hard** or **Soft** material

a. If the materials in the room are different is the sound different? Why or why not?

   **Yes** Or **No**

   → because hard material = **Loud** or **Quiet**

   → because soft material = **Loud** or **Quiet**
I modified lesson 3 on the how sound is transmitted, reflected and absorbed by through or off of varying objects and/or material by implementing ELL strategies, adjusted discourse and enhanced interaction. I used a variety of strategies to contextualize the lesson focusing of meaning, making “talk” comprehensible, provide opportunities for output, give students a voice in their own learning and allow for them to engage in appropriate activities differentiated by language proficiency levels. I began my lesson by building background knowledge and creating a shared history to develop the vocabulary and keywords that would be introduced throughout the lesson. This was done through the listening guide that began the lesson, where the teacher models for students what is expected and how they are to follow the steps needed to conduct different experiments. During this modeling the teacher used gestures, realia, (like using actual carpet padding and a ticking timer for the experiment) slowed the speech down and repeated certain phrases and keywords to make it more comprehensible. Throughout this activity the teacher models the language that is expected for students to learn and use. This language model was presented to students orally, visually, non-linguistically and written not only to assure that all learning needs are met but also to model the various ways that the students themselves will be explaining their findings after experimenting. Throughout the tasks that follow the lesson the teacher begins with modeling the process for each task and then proceeds to allow students to work either in groups or pairs to create opportunities to negotiate meaning, elicit student talk and practice instructional conversation. Students are expected to discuss and explain their findings to
group members or partners after writing down and/or creating visuals to describe their ideas. The student guide activities are differentiated according to language proficiency levels were the teacher has modified the written text to make it comprehensible, uses charts to organize the results that were concluded from the experiment, uses word banks and provides the listening guide to give students a reference point to refer back to and/or use to complete the assignment. The teacher also provides sentence starters and frames the main ideas to make the content and big idea comprehensible. At the end of the lesson the teacher gives students an exit slip to check for understanding and assess students reaching the objectives therefore indicating any further need of re-teaching or review the concepts introduced. The teacher also provides students with review and practice by giving a homework assignment which can also be used as a tool for informal assessment. Both check for understandings have been modified and differentiate to meet the needs of the students at their language proficiency level. All of these sheltered strategies, adjusted discourse and enhanced interaction was used to modify an original mainstream lesson in order to meet the needs of all the varying language levels students come with.
Checklists
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<th>Lesson</th>
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<tr>
<td>Adverbs</td>
<td>2,3</td>
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<td>Adjectives</td>
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<tr>
<td>Comparatives</td>
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<td>Quantifiers</td>
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<table>
<thead>
<tr>
<th>Function</th>
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<td>1,2,3</td>
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<td>Explain</td>
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<td>Compare/Contrast</td>
<td>3</td>
</tr>
<tr>
<td>Rank</td>
<td>1,2,3</td>
</tr>
<tr>
<td>Describe</td>
<td>1,3</td>
</tr>
</tbody>
</table>
Write the page numbers and any other identifying features to identify those parts of your lessons that employ the following strategies.

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<td>I.B. Develop Vocabulary</td>
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<td>III.A. Pace Teacher's Speech</td>
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<td>26-40</td>
<td>53-64</td>
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</table>
Original Lessons
University of New Haven, Inquiry Lesson 5.1.1

Concepts

Energy Transfer and Transformations – What is the role of energy in our world?

5.1 - Sound and light are forms of energy.

♦ Sound is a form of energy that is produced by the vibration of objects and is transmitted by the vibration of air.

Making Louder Sounds  (More Sound Energy)

Performance Expectations/Objectives

B 17. Describe the factors that affect the pitch and loudness of sound produced by vibrating objects.

[The purpose of this lesson is to explore how sound is produced by vibrating objects and to identify factors that affect the loudness of sound that is produced.]

Science Materials (for each grp of students): 3 rulers, 2 marbles, 2 rubber bands, 2 foam arches, 4 cups.

WARNING If you do not want the students to have the noisy fun balloons until they have completed the earlier tasks, then remove them from the packets before handing out the packets! ☺

Student Handout 5.1.1: Making Louder Sounds

Vocabulary: sound, energy, volume (loudness of sound), vibration

Inquiry: In this inquiry, students will experiment with different materials to identify the relationship between volume (loudness of sound) and the size of the vibration. Students will make different noise makers and experiment with loudness and softness by producing vibrations. Students will find some objects that do not vibrate well. Students can make repeatable sounds with a stretched rubber band or with a ruler placed over a hard object. Students will make standard sounds by dropping a ball from different heights and gauge the loudness of other sounds against their standard.

Procedures and Directions: Ask students to predict what they think produces sound. Guide students through Task 1 together, as a class and discuss how sound is produced through vibrations. Then assign students to groups to make and rank the noisemakers (see Handout 5.1.1).

Questions to Guide Student Inquiry:
1. Why does your sound maker get quieter as time goes by? Why is it quieter as you move further away from the source?
2. Why does the same ruler sound louder when snapped over the edge of some objects as opposed to others? Try comparing a ruler held against a hard desk with one held against a thick book.
3. What increased when you pull something further and harder? What motion is occurring on all your noise makers?
4. If you drop a ball from two different heights, why does one height make a quieter sound?
5. When you speak at a plastic cup loudly, is the vibration larger?
6. How does Force x Distance relate to the loudness of sound?
7. If you hold the cup further away from your mouth, is the vibration more?

Science Concepts: Sound is produced through vibrations of objects. Sounds can be created by using a variety of materials that will vibrate. Some softer objects do not vibrate and do not produce sounds. The loudness of the sound is affected by the amount of vibration. The closer we are to a sound, the louder it sounds.
Application Problems

Lesson 5.1.1

These assessment items are intended to provide closure for each lesson and help teachers determine how well the students understand the science concepts. The assessments are also intended to provide students additional practice with the lesson content. Teachers should use the assessment items as they deem appropriate. For example, teachers may wish to assign them for homework, assign them as an additional class activity or “quiz” at the end of a lesson, or ask students to answer them individually as they leave the class (as “exit passes”). Teachers may wish to use the problems as a closing class activity, asking students to solve the problem in groups and then share their answers in a whole group closing activity.

1. A school bell rings every morning. What causes the sound made by the bell?
   Motion, vibration in the material of the bell.

2. Imagine that you have a bell that looks like the one below. You ring the bell softly at first.
   a. How can you make the bell sound louder?
      Make it vibrate more vigorously by hitting it harder.

   b. Describe the different motion you would see when you make the bell louder.
      The vibration would be larger, this is the fuzzy blurring of the edges of a vibrating object.

   c. If you stopped the motion of the bell only by holding the bell in your hand, would the sound stop?
      Yes

   d. If you stopped the motion of the clapper only by holding the clapper in your hand, would the sound stop?
      No

3. Why can you hear what people are saying when they are next to you and not when they are much farther away?

   (Sound spreads out over the surface of a sphere, the larger the distance it travels the larger the surface
   (think of blowing up a balloon). The more spread out the energy is the quieter the sound.)
Task 1: Hold the cup just in front of your mouth. Speak into the cup and feel the cup. Try saying "Hubble bubble toil and trouble" or "Avada Kedavra". Speak again and feel the front of your neck.

What does the movement of the cup feel like? ..... buzzy fuzzy, vibrating, ticklish

What movement is always found when objects make sound? ... vibration

Task 2: Each student should choose one of the objects and make a noise with the object. Describe how you made noise with each noisemaker below:

<table>
<thead>
<tr>
<th>Object Used</th>
<th>What did you do to make the noise?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marble</td>
<td></td>
</tr>
<tr>
<td>Rubber Band</td>
<td></td>
</tr>
<tr>
<td>Ruler</td>
<td></td>
</tr>
<tr>
<td>Foam Arch Snapper</td>
<td></td>
</tr>
</tbody>
</table>

Make the same noise again, as you did above, using the same method. Then, rank your noise makers from quietest to loudest. You may notice that the same object can make different amounts of noise. You should try to be consistent, making about the same amount of noise each time you use one object.

Quietest

1. ..........................................................................................
2. ..........................................................................................
3. ..........................................................................................
4. ..........................................................................................

Loudest
Task 3: Work with a partner. Use the ruler so that you can drop the marble 1 cm onto the table. This will be your standard amount of sound.

Drop your ball from 1 cm, 5 cm, and 25 cm onto the table and notice that the loudness changes with distance.

Task 4: Work with a partner. One of you will drop the marble 1 cm to make a standard sound. The other chooses to use either the rubber band, the plastic ruler, or the foam arch snapper. Manipulate this one object so that it makes sounds that are sometimes louder, sometimes about the same, and sometimes quieter than the falling marble. Complete the table below.

<table>
<thead>
<tr>
<th>Object used</th>
<th>Distance</th>
<th>Snapped</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quieter than the marble dropped 1 cm</td>
<td></td>
<td>Stretched or Plucked</td>
</tr>
<tr>
<td>About the same as the marble dropped 1 cm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Louder than the marble dropped 1 cm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

What makes sounds louder?

......................... More energy, more motion, larger force, more distance pulled back...MORE WORK

What makes sounds softer?

......................... Less of the above. Concentrate on WORK and energy..................................................

Why is it important to be listening at the same distance from the two sound sources?

............. The energy gets spread out as you get further away, so we have to control for this spreading out of energy. ..........................
Inquiry Lesson 5.1.2  Exploring Pitch

<table>
<thead>
<tr>
<th>Concepts</th>
<th>Performance Expectations/Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Transfer and Transformations – What is the role of energy in our world?</td>
<td></td>
</tr>
<tr>
<td>♦ 5.1 - Sound and light are forms of energy.</td>
<td></td>
</tr>
<tr>
<td>♦ Sound is a form of energy that is produced by the vibration of objects and is transmitted by the vibration of air and objects.</td>
<td></td>
</tr>
</tbody>
</table>

B 17. Describe the factors that affect the pitch and loudness of sound produced by vibrating objects. [The purpose of this lesson is to explore how pitch is created and to identify the factors that create pitch.]

Science Materials: 4 nails of various size, 3 wooden bars various sizes, 4 latex free balloons, 1 three ring binder, 1 rubber band, 4 rulers, 20cm of pipe insulation, 4 narrow straws and 4 wider straws.

Student Handout 5.1.2 Exploring Pitch

Vocabulary: pitch, vibration

Inquiry: In this inquiry, students will explore how the pitch of similar objects is related to their size. They will also change the pitch of sound by changing the size and the tension or tightness of objects.

Procedures and Directions: Ask students to list a few animals and rank the noises they make, from high pitched squeals (such as a pig) to low pitched noises (such as a cow). Guide students to understand the concept of pitch and make sure to differentiate it from volume (loudness). For example, they may be able to hear both the pig’s and the cow’s loud noises from far away, but the noise each animal makes sounds different, because of the pitch of the noise.

Questions to Guide Student Inquiry

1. Why are soft objects not used in sound makers?
2. Is there a connection between the size of objects and the quality of the sounds they make?
3. Why can the same rulers make different sounds?
4. How can the neck of the balloon make different pitch sounds?
5. How does the pitch change as the vibrations speed up?

Science Concepts: Pitch is the property of sound that ranges from high, squeaky, tinny sounds at one end to low, deep, bass, sounds at the other. Small, short, and tightly stretched objects make higher pitched sounds than larger, longer, and less tightly stretched objects. Changing the length of a string changes the pitch, longer makes it deeper, shorter makes it higher. Changing the tension of a string changes the pitch, higher tension, the higher the pitch, lower tension (slacker) the lower the pitch.
Application Problems

Lesson 5.1 Exploring Pitch

These assessment items are intended to provide closure for each lesson and help teachers determine how well the students understand the science concepts. The assessments are also intended to provide students additional practice with the lesson content. Teachers should use the assessment items as they deem appropriate. For example, teachers may wish to assign them for homework, assign them as an additional class activity or “quiz” at the end of a lesson, or ask students to answer them individually as they leave the class (as “exit passes”). Teachers may wish to use the problems as a closing class activity, asking students to solve the problem in groups and then share their answers in a whole group closing activity.

1. A wire is cut into four pieces of different lengths. Each piece is stretched to the same tightness and the ends are tied to a block of wood. Which of the pieces, shown below, would give the lowest pitch if it were plucked in the middle?

   a)  

   b)  

   c)  

   d)  

(Adapted from NAEP Grade 8, 2005 Science Assessment)

Answer, d) associate lower pitches with longer and larger items

2. Humans have vocal folds in our necks. They are somewhat like rubber bands and we can feel them vibrate when we speak. Explain how humans change the pitch of sound with our vocal chords? By making our vocal folds low tension and large mass they move slowly making low pitches, by making them high tension and low mass we make them high pitch. Blowing raspberries with our lips produces the same behaviors.
**Task 1:** Hold the foam insulation on the table so that its two edges point up, not down. Place the nails and blocks of wood across the U shaped foam. Hit the center of the objects (a pencil will do nicely for hitting them). Choose one type of object and arrange the objects in order from low to high pitch.

Record your data below.

### METAL

<table>
<thead>
<tr>
<th>Lowest Pitch</th>
<th>1. length ..................</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. length ..................</td>
</tr>
<tr>
<td></td>
<td>3. length ..................</td>
</tr>
<tr>
<td>Highest Pitch</td>
<td>4. length ..................</td>
</tr>
</tbody>
</table>

### WOOD

<table>
<thead>
<tr>
<th>Lowest Pitch</th>
<th>1. length ..................</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. length ..................</td>
</tr>
<tr>
<td>Highest Pitch</td>
<td>3. length ..................</td>
</tr>
</tbody>
</table>
Handout 5.1.2 (page 2/3)

**Task 2:** Place a ruler across the edge of the desk such that a different length hangs off the table each time. For example, start with about 15 centimeters of the ruler hanging off the desk.

Hold the ruler flat on the table with the palm of your hand. Tap the edge of the ruler and note the vibration's speed and pitch. Repeat the task, keeping less of the ruler off the desk each time. Record your data in the table below:

<table>
<thead>
<tr>
<th>Length off the desk</th>
<th>What did you notice about the speed of the vibrations?</th>
<th>What did you notice about the pitch?</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 cm</td>
<td>Longer rulers vibrate more slowly</td>
<td>Longer rulers make lower pitch sounds</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

What conclusion can you draw about the relationship between the speed of the vibration and the pitch?

..........................Low pitch is associated with slow vibration speeds..........................

........The lowering of the pitch of a sound is often a good indication that a battery is failing. ........Think of a car engine cranking with a dead or nearly dead battery, or an electric toothbrush or toy with dying battery. .................................................................

**Task 3:** Put one narrow straw inside one wide straw, so that you can slide it in and out. Blow across the end of the straw and listen to the pitch of the sound. Change the total length of the straw by sliding the narrow straw in and out, and listen to hear the change to the tone. Write your conclusion.

When the straw gets longer the sound from blowing across it, gets ...Lower in pitch...........

When the straw gets shorter the sound from blowing across it, gets ...Higher in pitch...........

http://www.newhavenscience.org/51UNHSoundUnit.htm 2/22/2010
Handout 5.1.2 (page 3/3)

Task 4: Put your rubber band around your closed ring binder. Slide a ruler under the rubber band and turn the ruler sideways to make the band tight. Pluck the band and move the ruler to see how to change the sound.

Find two different ways to change the pitch of the band; you may move the ruler. (Hint, What made the pitch change in Task 3?)

Describe one way to make the pitch higher.

..........................Shorter length...........................................................

......................................................................................................................

Keeping the length the same, find another way to change the pitch. Describe how you can make the pitch go higher using this method.

..........................Higher tension (more force stretching the band)...........................

......................................................................................................................

Task 5: Let air out of a balloon while stretching the neck sideways so you get different pitches.

Describe what you did to make a high-pitched sound.

..........................Pull it taught with more force.....................................................

..........................Make the lips thin........................................................................

Describe what you did to make a low-pitched sound.

..........................Less force (also fatter heavier rubber lips)..............................

......................................................................................................................
Inquiry Lesson 5.1.3  

**Sound Transmission, Reflection, Absorption**

<table>
<thead>
<tr>
<th>Concepts</th>
<th>Performance Expectations/Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Transfer and Transformations – What is the role of energy in our world?</td>
<td>B 18. Describe how sound is transmitted, reflected and/or absorbed by different materials.</td>
</tr>
</tbody>
</table>

**5.1 - Sound and light are forms of energy.**

- Sound is a form of energy that is produced by the vibration of objects and is transmitted by the vibration of air and objects.

**Science Materials:** 1 ticking timer, samples of various materials including ear plugs, 4 squares of carpet padding, 4 plastic cups, wooden rod, file hanger with metal strip, 4 plastic rulers.

**Student Handout 5.1.3 Sound Transmission, Reflection, and Absorption**

**Vocabulary:** transmission, reflection, absorption

**Inquiry:** In this inquiry, students will investigate how sound travels through different materials. Students will rank materials by their ability to transmit sounds. They will decide which materials are better at absorbing, transmitting and reflecting sound.

**Procedures and Directions:** Ask students how fast they think sound travels. Have them recall a thunder storm. Tell students that both the lightening and the thunder happen at the same time. Ask them why they usually see the lightening first, and a while later, they hear the thunder. Guide students to understand that this phenomenon occurs because the light travels faster than the sound; it takes longer for the sound to reach our ears, than it does for the light to reach our eyes. In this lesson, students will investigate which materials transmit sound better. To introduce Task 2, ask students if they have ever heard an echo. Ask them what they think makes an echo. In the second task, students will explore how sound is absorbed and reflected (to make an echo).

**Questions to Guide Student Inquiry**

1. Does sound have to travel through air? What other materials can sound travel through?
2. Do sounds go through all materials as easily? Where does lost sound energy go?
3. What makes an echo? (Imagine hitting a tennis ball against a wall and having it bounce back).
4. Can you hear as well when you are wearing your ear muffs?
5. Can you hear outside sounds better with the window open or closed?
6. Which rooms are noisy and which rooms are quiet? Are the materials in the rooms different?

**Science Concepts:** Sound is reflected when sound strikes a different material than the one it is traveling through. When the sound is reflected the sound can be heard louder. In extreme cases, where there is a long delay between the original sound and the reflected sound, then there is an echo. Most of the time we do not hear reflected sound as an echo. Sound energy that is not reflected is either transmitted through the second material or it is absorbed and turned into small amounts of heat. Soft materials absorb a lot of sound. Hard materials reflect a lot of sound. Many materials, especially air, transmit sound energy well.

http://www.newhavenscience.org/51UNHSoundUnit.htm
Application Problems

Lesson 5.1.3

Sound Transmission, Reflection, and Absorption

These assessment items are intended to provide closure for each lesson and help teachers determine how well the students understand the science concepts. The assessments are also intended to provide students additional practice with the lesson content. Teachers should use the assessment items as they deem appropriate. For example, teachers may wish to assign them for homework, assign them as an additional class activity or “quiz” at the end of a lesson, or ask students to answer them individually as they leave the class (as “exit passes”). Teachers may wish to use the problems as a closing class activity, asking students to solve the problem in groups and then share their answers in a whole group closing activity.

1. Which of the following materials is most likely to absorb sound?
   a) A soft curtain
   b) A door
   c) A window
   d) A stone wall

2. The sun is very loud, but we can not hear it here on planet Earth. We can see light energy from the sun. Which of the following is true?
   a) Empty space, which we call a vacuum, transmits both sound energy and light energy
   b) Empty space, which we call a vacuum, transmits sound but not light
   c) Empty space, which we call a vacuum, transmits light but not sound
   d) Empty space, which we call a vacuum, does not transmit either sound or light

3. Here are three words: absorb, reflect, and transmit. Write the word that is closest to each of the following ideas:

   a) Bounces off ..........................Reflects.................................
   b) Goes through .........................Transmit..............................
   c) Gets lost within .......................Absorb..............................
Task 1: Place one piece of the soft carpet padding on the table.
Place the ticking timer on its back on the mat.
Put a plastic cup over your ear.
Put a ruler so that it touches the cup and the timer. Listen carefully

Then instead of the ruler use the metal strip of the file hanger between the timer and the cup.
Then instead of the metal strip use the cardboard of the file hanger between the timer and cup.
Then instead of the metal bracket dangle loose string between the cup and the timer.

Rank materials by their ability to transmit sound (let sound travel). Describe the textures of the materials through which the sound traveled (was transmitted). Record your data below:

<table>
<thead>
<tr>
<th>Loudest</th>
<th>Material</th>
<th>What does the material feel like (texture)?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ............ Harder..................................</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. ............ ........................................</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. ............ ........................................</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. ............ Softer..................................</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Quietest

Task 2: Hold the cup over your ear and hold a ruler so that it touches the cup and the timer.
Now pull the cup off the end of the ruler and place one of the soft ear plugs between the cup and ruler. Compare the amount of sound you get with and without the ear plug.

Write your observations here. ........................................

........................................Quieter with ear plug........................................

This is like part of an electrical circuit with an insulator in it.
Task 2 continued

What is the difference between using the ear plug when it is squeezed tight and using it when it is relaxed and expanded? Absorbs more sound when expanded.

Does the ear plug let more sound through when the sound goes across the long length (end to end) or the shorter length (side to side)? More goes across the short path.

Task 3 Put the timer, on its back, directly on the desk. Put your ear to the desk some distance from the timer and listen. Then introduce 1, then 2, then 3, then 4 layers of carpet underlay between the timer and the desk. You should stack them like pancakes. Record your data by putting an x in the correct place in each row.

<table>
<thead>
<tr>
<th>Loudest</th>
<th>2nd Loudest</th>
<th>Middle</th>
<th>2nd Quietest</th>
<th>Quietest</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Padding</td>
<td>One sheet</td>
<td>Two sheets</td>
<td>Three sheets</td>
<td>Four sheets</td>
</tr>
</tbody>
</table>

What kinds of materials transmit sounds most easily?

...Hard materials...

If the sound energy was not transmitted, where did it go? Absorbed and turned to heat.

...The most useless form of energy!

The sound energy that was not transmitted was Absorbed... (fill in one word)
Handout 5.1.3 (page 3/3)

**Task 4:** Think of a loud place. List some hard and flat objects in that room. Think of a quiet place. List some soft materials you find in the quiet room.

<table>
<thead>
<tr>
<th>Loud Room</th>
<th>Quiet Room</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hard flat surfaced materials</td>
<td>Soft open fabrics</td>
</tr>
</tbody>
</table>

What do you think happens when sound travels through the air and hits a hard object?

.........Bounces off (reflects).................................

What do you think happens when sound travels through the air and hits a soft object?

.........Goes inside and is absorbed..........................

The word *reflect* means to “bend back.” The word *absorb* means to “soak up.”

Does a soft material *absorb* or *reflect* sound? *absorb*

Does a hard material *absorb* or *reflect* sound? *reflect*