## Unit Plan Title:  Sound and Motion

<table>
<thead>
<tr>
<th>Primary Subject</th>
<th>Science</th>
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<tbody>
<tr>
<td>Integrated Subjects</td>
<td>Math, ELA</td>
</tr>
<tr>
<td>Grade Level</td>
<td>2nd</td>
</tr>
<tr>
<td>Length of Unit</td>
<td>7 days</td>
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<tr>
<td>Research Sources</td>
<td></td>
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<td></td>
<td><a href="http://www.housingaforest.com/dancing-oobleck/">http://www.housingaforest.com/dancing-oobleck/</a></td>
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### Unit Summary

Sound and Motion
Students will explore sound and vibrations. They will learn how sound travels, how sound and vibrating objects are related, and how movement affects sound. Students will use vernier probes to measure sound waves. They will create objects that produce similar sound waves when dropped.

### Key Vocabulary

- vibration
- vibrate
- sound wave
- movement
- energy
- pitch
- frequency
- eardrum
- vocal cords
- decibels

### NC Essential Standards for Science

2.P.1 Understand the relationship between sound and vibrating objects.

- 2.P.1.1 Illustrate how sound is produced by vibrating objects and columns of air.
- 2.P.1.2 Summarize the relationship between sound and objects of the body that vibrate-eardrum and vocal cords.

### Common Core Standards for Mathematics

2.MD.1 Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.

- 2.MD.4 Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit.

### Common Core Standards for ELA & Literacy

W.2.7 Participate in shared research and writing projects.

- SL.2.1 Participate in collaborative conversations with diverse partners about grade 2 topics and texts with peers and adults in small or larger groups.

### Essential Questions

- How does movement affect sound?
- Where are sounds found around us?
- How do sounds change?
- How are sound and vibrating objects related?
- How can you see and feel sound energy?
- How do we hear sound?
Materials & Resources

**Lesson One**
The Listening Walk by Paul Showers

**Lesson Two**
variety of musical instruments

**Lesson Three**
tuning fork
cardboard milk container
scissors
tissue paper
tape
small mirror
flashlight
spatula
rubber bands
boom box
balloons
paper plate
small pieces of paper

**Lesson Four**
corn starch
water
large speaker
cookie sheet
food coloring
test tones

**Lesson Five**
ear model
Sources of Sound Module - [http://www.engineeringinteract.org/resources/oceanodyssey/flash/concepts/sourcesofsound.htm](http://www.engineeringinteract.org/resources/oceanodyssey/flash/concepts/sourcesofsound.htm)

**Lessons Six and Seven**
box of materials for challenge (boxes, string, metal, tape, paper towel rolls, rocks, pipes, bean bags, etc.)
Vernier LabQuest (with external microphone)
Vernier Sound Level Meter
pudding
food to drop in pudding (raisins, blueberries, etc.)
<table>
<thead>
<tr>
<th>Activities/Procedures</th>
<th>Lesson One</th>
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</thead>
<tbody>
<tr>
<td>EQ: Where are sounds found around us?</td>
<td>- Read <em>The Listening Walk</em>. Take students on a listening walk. Have students write down everything they hear. Discuss that sounds are all around us. - After the listening walk, sort the things they heard by types of sounds (loud vs. soft; high vs. low).</td>
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| Lesson Two |

| Lesson Three |
| EQ: How does movement affect sound? EQ: How are sound and vibrating objects related? EQ: How can you see and feel sound energy? | - Explore the term vibration. Have students shake their bodies as fast as they can. Discuss that when something moves back and forth it vibrates. Explain that sound is made by vibrations too fast to see. Have students hum and place their fingers on their throat to feel the vibrations. - Explain that biomedical engineers study sound energy to design devices so that people who cannot speak or hear are able to create or identify sound waves. - In the activity stations students will learn more about sound energy. Stations include: tuning fork station, milk container-reflector station, spatula blade station, rubber bands on doorknob station, boom box station (see “Seeing Sounds Worksheet”). |
Lesson Four

EQ: How does movement affect sound?
EQ: How are sound and vibrating objects related?

- Review how sound and vibrating objects are related.
- To help students understand vibrations, create dancing oobleck:
  * Make oobleck (2 cups of corn starch, 1 cup of water)
  * Place a cookie sheet onto a large speaker and pour the oobleck in it.
  * Download different test tones and play them.
  * While the music is playing, hold your fingers on the edge of the cookie sheet with a little pressure to hold it down.
  * The oobleck will begin “dancing” because of the vibrations.
  * To add a greater effect, put a few drops of different food coloring and watch the colors mix.

Lesson Five

EQ: How do we hear sound?

- Have students brainstorm how we actually hear sound. What happens when the vibrations reach our ears?
- Show interactive ear model and discuss (http://www.hearingcenteronline.com/ear2.shtml) Demonstrate this with an ear model.
- To show how we hear sounds, complete the Sources of Sound module with students (http://www.engineeringinteract.org/resources/oceanodyssey/flash/concepts/sourcesofsound.htm)
Lessons Six and Seven

EQ: How does movement affect sound?

Challenge Given to Students:

Early this morning while (custodian) was unlocking the school, he heard a loud, strange sound. After investigating he discovered an unusual crater located near the playground. (Custodian) has marked off the area for your safety. After police, firefighters and local scientists analyzed the crater they have yet discovered what fell from the sky to make this mysterious indentation. The sound was captured on our camera system; however, we were unable to get a picture of the object. (Principal) has asked you, as young scientists, to research and discover what might have caused this.

As part of the challenge, students will use the Vernier LabQuest and/or Sound Level Meter to measure the sound level of the falling object. They will create an object that has similar sound waves and frequency as the one measured by the object that created the crater.

-To explain the terms crater and indentation, have students create pudding craters.

*Each small group gets a shallow dish of pudding.
*They take turns dropping/throwing various food items (blueberries, chocolate chips, raisins, etc.) into the pudding.
*Students will remove some of the objects to look at the crater/indentation the object made. They can measure the size of each and compare.

-To help students understand what sound waves look like, play the studyjams video (Sound) - http://studyjams.scholastic.com/studyjams/jams/science/energy-light-sound/sound.htm

-Students will plan and track their progress in their science journals.
-They will also use their iPads to take pictures and videos as they work. They will use these to document their progress by creating a slideshow or iMovie.

Accommodations for Differentiated Instruction

Small cooperative groups allow students to support each other’s learning.

Students can act out different vocabulary words.

Students can draw pictures in their science journals.

A variety of activities will be utilized throughout the unit to accommodate all learning styles.
**Cross Curricular Integration**

- Students will measure the dimensions of the crater.
- Students will measure and compare the indentions/craters made in the pudding (lessons 6-7).
- Students will write observations and plans in their science journals.
- They will create a project to share showing their results from the challenge.
- Students will be working with cooperative groups, speaking and listening to one another, throughout the unit.

**Assessments:**

- **Performance-based**
  - experimenting with instruments (lesson 2)
  - activity stations (lesson 3)
  - measuring sound waves (lessons 6-7)

- **Formative**
  - anecdotal notes from listening walk (lesson 1)
  - information gained from “Seeing Sounds Worksheet” and anecdotal notes taken during activity stations (lesson 3)
  - science journal (throughout unit)

- **Summative**
  - final project documenting work on PBL challenge (lessons 6-7)

**Extension Activities**

- Use Garage Band to create music with different pitches.
- Use the vernier to measure the sound waves of each pitch and compare.
- School-wide sharing day

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