Science 3-5: Sound and Vibration

Intended Audience: Students with significant cognitive disabilities

# **Standards:**

SC.3.P.10.1 Identify some basic forms of energy such as light, heat, sound, electrical, and mechanical.

SC.3.N.1.2 Compare the observations made by different groups using the same tools and seek reasons to explain the differences across groups.

SC.3.N.1.6 Infer based on observation.

SC.4.P.10.3 Investigate and explain that sound is produced by vibrating objects and that pitch depends on how fast or slow the object vibrates.

SC.4.N.1.2 Compare the observations made by different groups using the same tools and seek reasons to explain the differences across groups.

SC.4.N.1.8 Recognize that science involves creativity in designing experiments.

SC.5.P.10.1 Investigate and describe some basic forms of energy, including light, heat, sound, electrical, chemical, and mechanical.

 SC.5.N.2.2 Recognize and explain that when scientific investigations are carried out, the evidence produced by those investigations should be replicable by others.

# **Learning Objectives:**

1. Students will investigate how vibration affects the volume (loudness and softness) of sound.
2. Students will investigate how vibration affects the pitch of a sound.
3. Students will compare how different water levels affect the pitch of a sound.

# **Vocabulary:**

1. sound energy: the movement of energy through and object or substance
2. vibration: the fast back and forth movement of something
3. pitch: describes whether a sound is high or low

**Materials:**

* Video: [Understanding Vibration and Pitch](https://florida.pbslearningmedia.org/resource/phy03.sci.phys.howmove.collage/understanding-vibration-and-pitch/)
* 5 drinking glasses that are the same size
* water
* pitcher
* wooden dowels
* measuring cup
* Prior to instruction: visual supports for academic content

# **Essential/Guiding Questions:**

1. How does vibration affect volume?
2. How does vibration affect pitch?
3. How do different levels of water in a glass affect the pitch?

**Lesson Presentation:**

**Activating Prior Knowledge:**

1. Brainstorm activity: Ask students to make a list/identify images that make sound. This can be completed individually, in small or whole group.

2. Share out. Tell students that they are going to investigate one of the ways that water influences sound.

**Modeled instruction:**

1. Show students the video: [Understanding Vibration and Pitch](https://florida.pbslearningmedia.org/resource/phy03.sci.phys.howmove.collage/understanding-vibration-and-pitch/).

1. Teach vocabulary with visual supports as it relates to the video and investigation.

2. Show students five empty glasses. Ask “How can these glasses vibrate and make different sound?” Answers will vary. Capture student answers on a chart/graphic organizer.

3. Tell them that they’ll be engaged in an investigation of sound, water, and glass.

**Supported/Guided instruction:**

1. Review information from the video and related vocabulary.

2. Fill pitcher with water.

3. Line glasses up on a table, leaving a space between each.

4. Fill glasses with water in the following increments: 1/8 cup, 1/4 cup, 1/2 cup, 3/4 cup, and 1 cup.

5. Without touching the glasses, tell students that the glasses can make sound. Ask students how the glasses make sound. Answers will vary.

6. With a wooden dowel, tap the glass that has 1/8 cup of water. Ask students: What do you hear? (Sound, a note, pitch)

7. Tap the glass that has 1 cup of water in it. Ask students: What do you hear now? What is the difference between the 1/8 cup and the 1 cup? (Pitch is different., one is higher., one is lower., they both vibrate.) Answers will vary.

8. Continue to tap the dowel on the remaining glasses. Have students use dowel to tap glasses. What differences do they hear? (Each glass has a different pitch., Each glass vibrates to make sound.) Answers will vary.

**Independent Work:**

1. Give students in small groups a set of glasses, dowels, water and a pitcher.

2. Students repeat the investigation above, exploring how the vibrations and pitch change with varying water height.

3. Groups should be prepared to share findings.

**Small Group Suggestions:**

1. Students can read passages, [Sound and Hearing paired text: Music in Your Ear and A Loud Concert](https://www.readworks.org/article/Sound-and-Hearing/4635930d-d472-4562-8d9b-55801f4e804f#!articleTab:content/contentSection:ba4b5222-c7bc-4d7c-b9ea-d27c31a12407/). How does this connect to our glass and water investigation?

2. Students can engage in learning with fewer than five glasses.

3. Students can create a musical piece using the five glasses.

4. After creating a music piece, explain their “music” to the group.

5. Students can replicate the exploration with different materials (i.e. plastic instead of glass). Are the results the same?

**Assessment:**

1. Students will show how different levels of vibration and pitch create different sounds.

2. Teachers should utilize district created rubrics to score student work.

**UDL:**

**Multiple means of representation:**

1. Students can point to the glass that has a higher/lower pitch.

2. Students can use fewer glasses to complete investigation.

3. Students can pour different water levels into the glasses to see if there is a difference in vibration and pitch.

4. Students can use a metal object instead of a dowel to create sound.

5. Students can work individually, in pairs, or in a small group.

6. Students can work independently with peer or adult supports.

**Multiple means of expression:**

1. All students should have access to expressive language/technology that is appropriate for their specific need.

2. Expression may come in the form of verbal responses, signed responses, pointing/gestures, eye gaze, or through the use of a low or high tech device.

3. Text to speech options are available for computers on the Word app, iPads and other hand held devices. Google Chrome offers free extensions, such as Selection Reader and Select and Speak-Text to Speech, and apps, such as Text to Speech, Text to Speech with Google Drive, and TTS Reader- Unlimited Text-to-Speech.

4. Speech to text options are also available from Google. Extensions include Voice Note II-Speech to Text, Online speech recognition, and Co: Writer Universal. Voice Note II is also available as an app; Speech notes-Speech to Text Notepad is available as well. Microsoft Word also has speech to text options.

5. Additional information about text to speech and speech to text options are available through your district Assistive Technology Department.

**Multiple means of engagement:**

1. Provide students with support when pouring water in to glasses.
2. Students can use individual measuring cups or water levels that have been pre-measured.

3. Encourage collaboration with peers in partners or small groups.

4. Allow students to work independently.

5. Allow students to be positioned for maximum learning engagement.

6. Provide supervision for safety when outside.

**Assistive Technology Recommendations:**

1. All students should have a means of expressive communication and a way to be actively engaged in learning.

2. Response modes may include, but are not limited to: eye gaze, gesturing or pointing to pictures/words/phrases, signing, low tech devices (GoTalks, etc.), or dynamic devices (iPad, etc.)

3. Lesson vocabulary, photos/pictures and graphic representations should be created and/or printed prior to the lesson to provide all students with an opportunity to be engaged in discussion.

4. When possible, provide students with text to speech options. Articles and passages from Readworks.org have this option.

5. If students are writing in response to text or writing as a means of sharing information, provide students with alternates to pencils. Speech to text and alternative pencils should be considered. Find more information about alternative pencils here: [Alternative Pencils](http://alternativepencils.weebly.com/)

**Technology Needed:**

* Smartboard (to show video)

**Additional Resources:**

* From eschooltoday.com: [What is Sound Energy?](https://www.eschooltoday.com/energy/kinds-of-energy/what-is-sound-energy.html)
* From sciencekidsathome.com: [What is Sound?](http://www.sciencekidsathome.com/science_topics/what_is_sound.html)
* From Ducksters.com: [Sound 101](https://www.ducksters.com/science/sound101.php)
* From readworks.org: [Sound and Hearing paired text: Music in Your Ear and A Loud Concert](https://www.readworks.org/article/Sound-and-Hearing/4635930d-d472-4562-8d9b-55801f4e804f%22%20%5Cl%20%22%21articleTab%3Acontent/contentSection%3Aba4b5222-c7bc-4d7c-b9ea-d27c31a12407/)
* District-provided science resources