

# Coloma Community Schools Science Curriculum

<b>Science</b>	<b>SCI.IV.4.2</b>	<b>Grade: 5</b>
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**Strand IV:            Using Scientific Knowledge in Physical Science**

**Standard 4:            **Waves and Vibrations - All students will describe sounds and sound Waves.****

**Benchmark 2:            **Explain how echoes occur and how they are used.****

**Constructing and Reflecting:**  
**SCI.I.1.1** - Generate scientific questions about the world based on observation.  
 • Construct questions for each of the investigations suggested below to guide the design of the investigation.  
**SCI.I.1.2** - Design and conduct scientific investigations.  
**SCI.I.1.4** - Use metric measurement devices to provide consistency in an investigation

<p><b>Vocabulary/Key Concepts</b></p> <ul style="list-style-type: none"> <li>• echo</li> <li>• sonar</li> <li>• reflection</li> </ul>	<p><b>Context</b></p> <p>Echoes in rooms:</p> <ul style="list-style-type: none"> <li>• acoustics</li> <li>• outdoors</li> </ul> <p>Practical uses of echoes:</p> <ul style="list-style-type: none"> <li>• navigation by bats and dolphins</li> <li>• ultrasound imaging</li> <li>• sonar</li> </ul>
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<p style="text-align: center;"><b>Knowledge and Skills</b></p> <p>Students will explain how echoes occur and how they are used. Echoes occur when sound waves are reflected (bounced off) a large object and heard by the human ear. The absence of an echo means the sound waves are absorbed and not reflected back to the ear or the reflecting object is too close to produce an echo. The controlling of echoes (reflected sound) in a room or building is called acoustics.</p> <p>Sound must travel to the reflecting surface and back to produce an echo.</p> <p>Echoes have many uses. With sonar, a sound wave is reflected back and received by a receiver. By using this device one can measure how far an object is from the sonar device. Sonar is used by bats to locate objects.</p>	<p style="text-align: center;"><b>Resources</b></p> <p style="color: orange;">Coloma resource to teach this benchmark?</p> <ul style="list-style-type: none"> <li>• Scope Unit – <a href="#">Observing and Measuring Waves and Vibrations</a> (includes 10 lesson plans)</li> <li>• The Wizards Lab – <a href="#">Sound and Waves</a></li> <li>• <a href="#">The Sundry</a> – Thinkquest 98</li> <li>• Bill Nye: Eyeball, Light/Color, Light/Optics, Sound, Waves</li> <li>• AIMS – Echoes</li> <li>• Physical Science Worktext, Jules Weisler, AMSCO School Publications</li> <li>• Science Explosion: Waves and Vibrations</li> </ul> <p><b>5<sup>th</sup> Grade Science Curriculum</b>  <b>Technology Resources</b>  <b>IV.4.MS.2</b>          Vernier probes available: Motion Detector</p>
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<b>Instruction</b>	<b>Assessment</b>
<p><b>Focus Question:</b> How can an echo be heard when a sound is made in an echo producing place (hallway, stairwells, gym, auditorium, etc.) around the school?</p> <p>Take the students on a field trip to an echo-producing place in or around school. Once in place, the students need to produce an echo and note the following: distance from the reflecting surface, the type of reflecting surface, and any objects that might interfere with the sound's reflection (See Benchmark Clarification). Discuss what conditions are needed to produce an echo.</p>	<p>Students will sketch and label a location in their home or school where an echo would be produced. The following should be noted for this location: distance from the reflecting surface, the type of reflecting surface and any objects that might interfere with the sound reflection. Create a second sketch of this same location adding materials to change the acoustics to eliminate the echo. Students will present and explain their project.</p> <p>(Give students rubric prior to activity)</p> <p><b>Criteria: Accuracy of explanation:</b></p> <p><b>Apprentice</b> - Identifies some of the conditions needed to produce an echo and explanation is incomplete.</p> <p><b>Basic</b> - Identifies and explains conditions needed to produce an echo or simply identifies conditions.</p> <p><b>Meets</b> - Identifies and explains all conditions needed to produce an echo (appropriate distance, reflecting sound waves, and appropriate reflecting surface).</p> <p><b>Exceeds</b> - Identifies and explains all conditions needed to produce an echo (appropriate distance, reflecting sound waves, and appropriate reflecting surface) and determines that the distance must be greater than seventeen meters.</p>

**Teacher Notes:**

**Focus Question:** How can an echo be heard when a sound is made in an echo-producing place (hallway, stairwells, gym, auditorium, etc.) around the school?

Sound energy is transferred from molecule to molecule by cascading collisions within the medium. Echoes are sounds that bounce off hard surfaces and reflect back to the source.

• “Vibrations in materials set up wavelike disturbances that spread away from the source. Sound and earthquake waves are examples. These and other waves move at different speeds in different materials” (BSL). These waves transfer energy by setting the material (medium) in vibrating motion. The strength of the motion is in the amplitude of the wave; the speed of vibration is its frequency.

**Focus Questions**

- How does sound travel through solids, liquids and gases?
- How do echoes occur and how are they used?

**Notes**

The state benchmarks are very deliberately constructed to take students through these topics sequentially and developmentally. For example, students do not talk about sound and light as waves until the high school benchmarks – they only look at vibrating objects and mechanical waves such as those in slinkies or on water in middle school. They recognize sound as produced by vibrations at the elementary level; they study the motion of vibrating objects at the middle school level; and they apply the concepts of vibrations to sounds at the high school level. • Students are not expected to know the speeds of sound in different media.