

## Hearing and Sound

Kindergarten: From pitch to volume to using your hearing to locate objects, students will learn about how we can use our hearing to explore the world around us. Students will also have a brief and simple introduction to how our ears work to allow us to hear things. The presentation will wrap up with strategies to protect our hearing.

Grades 1-2: Test your ability to identify mystery sounds without the benefit of seeing what made the sound. Examine the challenges between memories of familiar sounds versus unknown sounds. Create vibration waves using pop bottle resonance to understand the difference between high and low frequency sounds. Use tuning forks to further examine resonance patterns of pure sounds. Test your ability to locate where certain sounds are coming from. Finally, explore problems that loud sounds can cause on our auditory system.

### Grade-Specific Summary Table

This demo has two versions: Kindergarten-Friendly and Grades 1-2. This table covers all applicable grades.

Grade	Curriculum Focus	Demo Activity	Key Concept(s)
Kindergarten	Using Senses to Explore	Mystery sounds Eardrum model Pop bottle resonance Direction of sound Harmful sounds	Hearing explores the world Sounds are waves Loud vs quiet, high vs low pitch Protecting ears from loud noises
1	Energy - Movement Earth Systems - Senses	Slinky wave demo Mystery sounds Eardrum model Tuning forks Resonance experiment	Movement has direction, pathway, speed Sounds are waves with amplitude and frequency Observe environments using hearing Sound travels through air
2	Energy - Sound Behaviors	Slinky amplitude/frequency Mystery sounds Eardrum demonstration Pop bottle resonance Tuning forks Decibels and hearing damage	Behaviors of sound affect characteristics Amplitude = loudness, Frequency = pitch Sound waves travel and vibrate eardrums Protecting ears from harmful noise levels

## Detailed Curriculum Links and Objectives by Grade

### Kindergarten: Using Senses to Explore the World

Curriculum Link:

- Students learn about how we use hearing and sound to explore, investigate, and describe the world.

Demo Activities: Mystery sounds listening game (13 sounds to identify), Eardrum model with plastic wrap and sprinkles, Pop bottle resonance demonstration (water levels create different pitches), Direction of sound activity (simplified Marco Polo), Harmful sounds discussion and ear protection

Objectives:

- Understand sounds come in many forms: music, noise, speech.
- Learn sounds are made of waves (like ocean waves but invisible).
- Understand loudness depends on wave height (amplitude): tall wave = loud sound, small wave = quiet sound.
- Understand pitch depends on wave spacing (frequency): close together = high pitch, far apart = low pitch.
- Identify common sounds using hearing (ice cubes, animals, doors, weather).
- Learn how eardrum works: sound waves cause eardrum to vibrate, vibrations become nerve signals to brain.
- Observe eardrum model: sprinkles jump when sound is made near plastic wrap.
- Understand resonance: less water in bottle = lower pitch sound.
- Learn sound reaches one ear before the other, helping locate sound direction.
- Identify harmful sounds (loud noises, prolonged exposure) and ways to protect ears (lower music volume, wear earplugs).

### Grade 1: Energy - Movement & Earth Systems - Senses

Curriculum Link:

- Energy unit: Movement consists of direction, a pathway, and speed.
- Earth Systems unit: Environments are observed and understood using the senses.

Demo Activities: Slinky wave demonstration (amplitude and frequency), Mystery sounds listening game (14 sounds), Eardrum model with plastic wrap demonstration, Pop bottle resonance hands-on experiment, Tuning fork vibrations and pitch comparison

Objectives:

- Understand sound is a form of energy that moves through air in waves.
- Learn movement of sound waves has direction (toward ear), pathway (through air), and speed.
- Use slinky to visualize waves: manipulate amplitude (loud vs quiet) and frequency (high vs

low pitch).

- Observe environments using hearing sense: identify 14 different mystery sounds.
- Understand brain uses memory to identify familiar sounds; unfamiliar sounds may be mistaken.
- Learn detailed ear anatomy: sound waves → eardrum → tiny bones (smallest in body) → cochlea → nerve signals → brain.
- Model eardrum function: sound waves cause vibrations (sprinkles move on plastic wrap).
- Conduct resonance experiment: predict, observe, conclude about water level effects on pitch.
- Understand tuning forks produce specific notes through vibration.
- Learn sound travels through air: distance from source affects what we hear.

### Grade 2: Energy - Sound Behaviors

Curriculum Link:

- Energy Unit: The behaviors of sound affect its characteristics.

Demo Activities: Slinky amplitude and frequency manipulation (hypothesis, experiment, observation, conclusion), Mystery sounds with scientific reasoning, Eardrum demonstration with sound wave explanation, Pop bottle resonance with scientific method, Tuning forks with pitch analysis, Decibels and hearing damage discussion

Objectives:

- Understand how sound behavior (loud/quiet, high/low) changes wave characteristics.
- Learn amplitude (wave height) determines loudness: large amplitude = loud sound, small amplitude = quiet sound.
- Learn frequency (wave speed/spacing) determines pitch: high frequency = high pitch, low frequency = low pitch.
- Use scientific method with slinky: hypothesize → experiment → observe → conclude for different sound types.
- Understand rarely hear perfect waves; usually hear mixture of waves (choppy), which makes each sound unique.
- Learn brain picks apart mixed waves using memory to identify sound source.
- Model eardrum: understand sound waves are changes in air pressure causing vibrations.
- Apply scientific method to resonance: predict pitch changes, observe water level effects, conclude relationship.
- Explain resonance scientifically: air particles create waves in bottle, less water = larger wave = lower pitch/frequency.
- Learn opposite happens when tapping bottle: water vibrates (not air), more water = higher pitch.
- Understand each tuning fork produces specific note (like piano key) through vibration at particular frequency.
- Learn about decibels (dB): conversation = 60 dB (safe), loud music = 100 dB (damage after 15 min/day), thunder/fireworks/gunshot = immediate damage.

- Understand prolonged loud noise damages cochlea: may permanently lose ability to hear specific notes.
- Identify ear protection methods: lower volume, wear earplugs in loud environments (concerts, construction sites).

### **Scientific Method Integration**

Grades 1-2 demonstrations emphasize scientific method:

- Hypothesis: Students predict outcomes before experiments (slinky waves, resonance, eardrum vibrations)
- Methods: Clear procedures explained and followed (water pouring, sound making, observation)
- Observations: Students record what they see/hear during demonstrations
- Conclusions: Students explain why results occurred and whether hypothesis was correct
- Discussion: Connect experiments to real-world hearing experiences

**Activity-Based Summary Table**

<b>Demo Activity</b>	<b>Curriculum Outcome</b>	<b>Key Concepts</b>
Mystery Sounds Listening Game	Using senses to observe environment, Memory and identification	13-14 sounds to identify (ice cubes, animals, weather, household items); brain uses memory to recognize familiar sounds
Slinky Wave Demonstration	Sound waves, Amplitude and frequency	Manipulate slinky to show: loud = big waves (high amplitude), quiet = small waves (low amplitude), high pitch = close waves (high frequency), low pitch = far waves (low frequency)
Eardrum Model (Plastic Wrap)	How hearing works, Sound waves cause vibrations	Sprinkles jump on plastic wrap when sound is made; models how sound waves vibrate eardrum in ear
Pop Bottle Resonance	Pitch and frequency, Scientific method	Less water in bottle = lower pitch sound (larger wave, lower frequency); more water = higher pitch; opposite when tapping bottle
Tuning Forks	Specific pitches/notes, Vibrations create sound	Each fork produces particular note; vibrations travel through air to ears; distance from source affects sound
Direction of Sound Activity	Sound localization, Brain processing	Sound reaches one ear before the other; brain uses timing differences to locate sound direction (simplified Marco Polo game)
Harmful Sounds & Ear Protection	Hearing damage prevention, Decibels	60 dB = conversation (safe), 100 dB = loud music (15 min damage), thunder/fireworks = immediate damage; protection: lower volume, earplugs