# *Sound and hearing* Teaching and learning plan

## Learning intentions

Students will be able to:

* identify that sound is produced by vibrations can be sensed
* demonstrate that sound can travel through a range of materials
* produce, identify and compare sounds using a range of objects
* identify and sort sounds using volume as a criterion
* identify and sort sounds using pitch as a criterion.

## Suggested timeframe

The time needed to complete the *Sound and hearing* CLE will depend on the depth of the prior knowledge of students. There are three investigations – ‘Making and listening to sounds’, ‘Sound energy travels through a solid material’, ‘Sensing the volume and pitch of sound’. Follow up with any further extension activities. Allow 3–4 hours.

[**Planning ahead and equipment list**](http://assist.asta.edu.au/sites/assist.asta.edu.au/files/Planning%20and%20equipment%20list_Yr1_SoundHearing.docx)

## Safety considerations

When you and your class are completing your Risk Assessment, consider the following safety points and add any other relevant ones to the list.

* Identify students who experience impaired hearing and assist those students with tasks and activities that require a good hearing ability (in the normal hearing range) or normal hearing acuity.
* Identify and support students who may respond poorly to loud sounds in the class situation, given that the unit encourages students to produce a range of sounds (in volume and pitch).
* When undertaking the suggested activities and tasks outdoors, for example, working in the schoolyard or walking along the school’s neighbouring footpaths, ensure that students are properly supervised and know the boundaries and limits of the outdoor space in which they are working. That students must be able to see the teacher at all times, and the teacher must be able to view any student working outdoors at any given time are effective ‘rules of thumb’. Ensure sun safe practices are in place when working outdoors.
* When using pieces of wood to conduct investigations into sound, it would be advisable to obtain samples that are smooth or sanded as the surfaces of some rough-cut samples may risk piercing the skin of students with splinters of wood.
* Using take-away coffee cups, rather than metal cans, is highly advisable and recommended. Metal cans can cut the skin.
* Care needs to be taken if you allow students to pierce the base of a polystyrene cup with a wooden skewer. Alternatively, to eliminate a chance of a student being injured, it may be advisable to pierce each cup prior to carrying out Investigation 2.

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## Introduction

This CLE focuses on investigating sound and hearing in the context of the many sound sources experienced in the environment, how this sound is sensed and links to Year Level 1 Australian Curriculum: Science.

### Equipment needed

* A variety of everyday items that make sound, for example, crumpled paper, a plastic shopping bag, coins, water to be poured into a cup.
* 5 small opaque plastic containers (e.g., plastic film canisters) containing small objects such as drawing pins, sugar, dirt, marble, stones and coins.

### What to do

### Listening investigations

1. In the classroom instruct students to sit quietly and listen for sounds. **Identify and describe the source of each sound** that is heard. Encourage students to use ‘sound words’ for example: pop, bang, rustle, squeak, ping.

Record on a whiteboard or chart, for example:

|  |  |
| --- | --- |
| Sounds we heard in our room today | |
| Sound heard | Source of sound |
| someone speaking | someone’s voice box |
| rumbling | motor car engine |
| tinkling sound | running water |
| ringing | telephone |
|  |  |

1. Instruct students to walk and listen for sounds outside the classroom. Identify and describe the source of each sound that is heard.
2. Record on a whiteboard or chart, for example:

|  |  |
| --- | --- |
| Sounds we heard in in our yard today | |
| Sound heard | Source of sound |
| someone speaking | someone’s voice box |
| tweeting | bird’s voice box |
| rumbling | jet plane engine |
| rustling | leaves moving in the wind |
| banging | hammering a nail |
|  |  |

1. Instruct students to draw and label at least 3–4 different objects and note how those objects produce a sound might e.g. door closing, singing bird, TV, car, drummer beating drum.
2. Record questions raised by students on a whiteboard or chart. Students may add their questions to the board as the lesson progresses.
3. Play a game of ‘Mystery sounds’ where you or a student produce a sound behind a whiteboard and the class attempts to identify what is making the sound and how the sound is produced, for example, crumpling paper, rustling plastic, clapping, clicking fingers, pouring water, jingling coins.
4. Ask students to predict what is in the small containers by listening to the sound that is made when they move the containers around in their hands.

## Core

### Investigation 1 – Making sounds and listening

In this investigation, students engage in a number of experiences requiring them to **produce, sense and identify** **sounds using a range of sound sources.**

This investigation can be conducted as a whole class investigation or as a smaller group task. It is recommended that students work in pairs.

The sound sources need to be readily available to students. As the teacher interacts with a pair of students it is advisable that they prompt students to articulate how any given sound is produced, to describe the sound and to reproduce the sound.

### Equipment needed

* Assorted percussion instruments, guitar
* Whistles
* Rulers
* Balloons
* Drum and drumstick
* Stethoscopes
* Computers/devices with Internet access

### What to do

1. Place students in pairs and ask them to investigate various ways of producing sounds with the range of percussion instruments you have provided.
2. Instruct students to produce or observe some of the following sound experiments.

* Feel your Adam’s apple as you hum.
* Twang a ruler on the edge of a desk.
* Gently scratch the outside of an inflated balloon while holding it to your ear.
* Pluck a guitar string.
* Blow through a whistle.
* Beat a drum with a drumstick and feel the surface or skin of the drum.
* Produce various sounds using air escaping from an inflated balloon.
* Use a stethoscope to listen to another’s heartbeat or breathing.
* Put your ear to the surface of a table, tap the table top and listen.
* Produce a squeaky Baby Bear voice (Goldilocks story) and compare with a deep, gravelly Father Bear voice.
* Play the interactive game ‘Sound and hearing’, Activity 1 Identifying sounds and Activity 2 Sorting instrument sounds, Crickweb, <http://www.crickweb.co.uk/ks1science.html>
* Play the ’Listen: Online Activities’, Exploratorium website <http://www.exploratorium.edu/listen/index.php>

1. Ask students to describe what they observe happening in each sound experiment. Use a question prompt to probe student thinking, for example:

* What actions did you do to make the sound?
* How do you think the sound was made?
* What do you think is happening to make this sound?
* How did you sense each sound?
* Show how you make the sound.

1. Record student responses on a whiteboard or chart.

Take note of the scientific terminology used by students, for example, ‘vibrate’, ‘sound’, ‘move’, ‘loud’, ‘soft’, ‘high sound’, ‘low sound’, ‘hear’, ‘air’. Scientific terminology used by teacher and students should be highlighted, as students are encouraged to use various terms during the course of their discussions and in their recording tasks.

### Expected results and explanations

The learning intention is addressed through students demonstrating and discussing how an object produces sound by an action that makes the object vibrate. Students are provided with a range of materials with which to conduct their investigations. Secondly, students demonstrate that various materials may be used to produce a range of sounds. By undertaking the recommended tasks, students should begin to associate vibrations with sound.

Students may describe or explain their ideas about sound and hearing and use appropriate terminology including ‘sound’, ‘move’, ‘louder’, ‘softer’, ‘high sound’, ‘low sound’, ‘hear’, air’. It would assist student learning if the teacher introduces and uses given terms as opportunities arise.

### Investigation 2 – Sound travels through a solid material

In this investigation, students produce and test a working string telephone. This experience **demonstrates a way in which sound energy can be detected travelling** through a solid material such as string and take-away coffee cups Students will manipulate a range of materials and will test the effectiveness of their string telephone.

### Equipment needed (per pair)

* Thread e.g., string or wool (4–5 metre lengths)
* 2 take-away cups
* Scissors
* Wooden skewer
* 2 matchsticks (head removed) or toothpicks
* worksheet, [Sound travels](http://assist.asta.edu.au/sites/assist.asta.edu.au/files/Student%20worksheet_Yr1_SoundHearing_0.docx)

### What to do

Stage 1 – Demonstration

View and discuss this video of two early years students who are showing how to use their string telephones: ‘Science Experiment : Telephone cups and string’, YouTube (1:39 min) <https://www.youtube.com/watch?v=-u6zPv6o8K0>

Pose a challenge to students to make a string telephone that can be used to carry sound (a message) from one person to another. Demonstrate, using a pair of students, the procedures that the students will follow when making a toy string telephone.

1. Using scissors cut a piece of string (or wool) of 4–5 metres in length. (Cut some lengths prior to lesson and place where students may view them to approximate their own lengths.)
2. Gently pierce a small hole in the base of two polystyrene cups with a wooden skewer. The string will go through this hole.
3. Use a matchstick to tie and secure the string outside each cup. (This will hold the string in place when the string is pulled taut).
4. Assign one student as the speaker and the other as the listener. Students stand apart (with no obstacles in their path) and keep the string taut.
5. Instruct the speaker to face the listener and ask the listener to stand at right angles (holding the cup to their ear and keeping their hands clear of the string). The speaker holds their cup in front of their mouth. Ask the speaker to pose some questions or give a simple instruction to the listener such as: How many bears are in the Goldilocks story? Jump 3 times. Hold up 2 fingers.
6. Listener and speaker swap roles.
7. Invite students to ask questions about the procedure.

Stage 2 – Students make a string telephone

In pairs, students follow the demonstrated procedure to make a string telephone and test it.

During this stage circulate, assist and guide students as necessary.

Challenge students to describe or explain what they observed when using their string telephones. When using a string telephone, the tautness of the string is important to achieve a successful outcome. It is likely that an unimpeded taut string will convey the sound from a speaker effectively, whereas a loose or impeded string will not convey sound. Where classroom space restricts students’ movements, students may test their telephones outdoors.

The questions below might assist a teacher gain insights into student thinking. It may be useful to record these questions on a whiteboard or chart where the students are able to read them.

* What actions did you take to make the sound travel?
* How do you think the sound travelled from the speaker to the listener?
* What do you think is happening to make this sound travel?
* How is your telephone test working out?
* How do you know that you have succeeded in making a string telephone work?

Stage 3 – Reflect

1. When students have completed their ‘make and test’ task, distribute the worksheet [Sound travels](http://assist.asta.edu.au/sites/assist.asta.edu.au/files/Student%20worksheet_Yr1_SoundHearing_0.docx) for students to complete.
2. Ask students the questions below. (Note the terminology they use, their ideas and their talk about how they think sound travelled from the speaker to the listener.)

* Did you have any problems or challenges with your string telephone?
* How could you improve the sound that travels from the speaker to the listener?
* Which other threads might you use in this investigation?
* What questions do you have about this investigation?

### Expected results and explanations

The learning intention is addressed by students demonstrating that sound energy can be detected travelling through a solid material such as string. To achieve this, each student will manipulate materials, follow a procedure and participate in a collaborative task with another student to produce a working string telephone. This task provides an opportunity for students to explore the transmission of sound through solid mediums such as string and a polystyrene cup.

### Investigation 3 – Sensing the volume and pitch of sound

In this investigation **students identify and sort sounds** using, firstly, volume, and, secondly, pitch as criteria. These experiences lead students to gain knowledge about the differing qualities of sounds.

### Equipment needed

* Pictures or labels of commonly heard sounds – ‘Overhead thunder’, ‘Jet plane’, ‘Train’, ‘Person talking’, ‘School bell’, ‘Bird whistling’, ‘Leaves rustling’, ‘Person whispering’
* Labels – Softest, Loudest
* Pictures, labels or sound bites of high-pitched sounds – ‘Snake hissing’, ‘Whistle’, ‘Baby Bear in Goldilocks story’, ‘Siren’, ‘Spoon hitting a glass bottle’
* Pictures, labels or sound bites of low-pitch sounds – ‘Distant thunder’, ‘Dog growling’, ‘Father Bear in Goldilocks story’
* Labels – ‘Low-pitch sound’, ‘High-pitched sound’
* Computers/devices with Internet access

### What to do

Volume sort

1. Jumble the prepared labels or pictures of commonly heard sounds.
2. Read them out to the students. Introduce the term **volume** as how loudly we sense a sound.
3. Place a continuum (line, thread, strip of paper) on the floor with the label ‘Softest’ and one end and the label ‘Loudest’ at the other. Instruct the students to place the labels of common sounds on the line, starting with the softest sound (least volume) and ending with the loudest sound (most volume).
4. Ask students the following questions.

* How did you decide where to place each item on your ‘Volume sort’?
* What makes one sound softer than another?
* What makes one sound louder than another?
* What difference in volume would you observe if you were closer to a source of sound than if you were far away?

Pitch sort

1. Invite students to imitate sound situations such as those on the ‘pitch’ labels, or prepare audio examples for students to listen to and identify.
2. Jumble the prepared labels of both high-pitched and low-pitch sounds.
3. Introduce the term **pitch** as how high or low we sense a sound. Students sort these sounds as a high pitch sound or as a low pitch sound under labels ‘Low-pitch sound’ and ‘High-pitched sound’.

Circulate and interact with pairs of students. The questions below might assist a teacher gain insights into student thinking. It may be useful to record these questions on a whiteboard or chart where the students are able to read them.

* How did you decide where to place each item on your ‘Pitch sort’?
* Describe how you can tell a sound is high-pitched.
* Describe how you can tell a sound is low-pitch.
* How can you make a low-pitch sound using your voice?
* How can you make a high-pitched sound using your voice?

1. Students can play the following interactive games:

* ‘Sound and hearing’, Activity 1 Identifying sounds and Activity 2 Sorting instrument sounds, Crickweb, <http://www.crickweb.co.uk/ks1science.html> [Scroll down to ‘Sound’] (User identifies sounds)

### Expected results and explanations

The learning intention is addressed by students showing that they can identify and sort examples of sound, firstly, by using volume as a criterion and, secondly, by using pitch as a criterion. To achieve the learning goal for volume examples, students will use their prior knowledge of everyday observable events such as the sounds produced by a jet plane, leaves rustling, a person speaking and will sort these events from the softest sound to the loudest. Volume is simply how loud we sense (hear) a sound. The volume of any given sound can be measured in decibels. Refer to the chart below.

|  |  |
| --- | --- |
| Volume measure in decibels | Event |
| 130 | Overhead thunder |
| 120 | Jet plane |
| 80 | Train |
| 70 | Bell |
| 60 | Person speaking |
| 30 | Bird whistling |
| 15 | Person whispering |
| 10 | Leaves rustling |

To achieve the learning intention for pitch examples, students will use their prior knowledge of everyday sound events such as distant thunder, dog growling and Father Bear in the story of Goldilocks, to sort them into high-pitched and low-pitch sounds. Pitch describes how high or low we sense (hear) a sound. Fast vibrations produce high-pitched sounds while slow vibrations produce low-pitched sounds.

## Conclusion

A teacher may invite students to ask or raise a question about a given sound experiment. The questions (i.e., ‘Alternatively…’, ‘I wonder…’) posed by students can be revisited. This will give students an opportunity to articulate their findings, their insights into their understandings and to identify improvements in skills they practised or acquired through their investigations. It is a prudent practice to revisit a given sound experiment as new insights may emerge and ‘light bulb’ moments may occur.

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### Additional lessons and activities about sound and hearing

* Use these five sound and listening online games and challenges:

’Listen: Online Activities’, Exploratorium website <http://www.exploratorium.edu/listen/online_activities.php>

### Assessment opportunities

* Invite students to discuss and then record by drawing and/or using words in the form of labels and captions to describe and give possible explanations of what they observed happening in a given sound experiment of their choice.
* Invite students to ask or raise a question that they have on their mind about a given sound experiment. A teacher may prompt a student to ask a question: Which question do you have about one of the sound experiments that you observed or carried out? List student questions on a class whiteboard or chart. Questions posed by students will assist you with assessing their understandings about sound sources.

|  |  |
| --- | --- |
| Questions about our sound experiments | |
| Sally asked | How did the ruler vibrate on the edge of the table? |
| Alex asked | What makes the bang sound when a balloon full of air bursts? |
| Minh asked | How does my throat make different sounds? |

Investigation 1 provides an opportunity to assess student understanding of the concepts related to sensing and identifying sound and sound sources. In addition, a teacher could assess the level of student achievement of the Science Inquiry Skills, namely, the ability of students to make predictions, represent and communicate their observations and ideas in a variety of ways such as oral and written language, drawing and role play.

Investigation 2 provides an opportunity to assess student understanding of the concepts related to vibrations producing sounds and that sound travels through materials such as string and a polystyrene cup. In addition, a teacher could assess the level of student achievement of the Science Inquiry Skills, namely, the ability of students to participate in different types of guided investigations to explore and answer questions, such as manipulating materials and testing their string toy telephone.

Investigation 3 provides an opportunity to assess student understanding of the concepts related to the various degrees of volume (loudness) of sounds and the numerous pitches of sounds. In addition, a teacher could assess the level of student achievement of the Science Inquiry Skills, namely, the ability of students to complete the sorting tasks for, firstly volume and, secondly pitch. A teacher may observe and assess the following:

How well did a student describe or explain his/her ideas on volume?

How well did a student describe or explain his/her ideas on pitch?