

SparkLab, Sciencentre

Maker Space: *Sound Makers*

The Challenge

Strum, rattle, tap, strike and pluck! Design a Sound Maker that can produce a range of different sounds. How will you control and change the pitch and volume of these sounds? Use free online sound testing apps to explore what the different sounds “look” like.

Learning Outcomes

- Explore the vibrational nature of sound and gain an understanding of how the sounds produced are dependent on the size, shape and type of material vibrating.
- Recognise the potential for our sense of hearing to inform us on the properties of different sounds and hone abilities to distinguish and describe different tones (high and low pitch).
- Compare these auditory observations to a visualisation of sound using a free website such as *Chrome Music Lab – Spectrogram*.
- Play with your voice and compare sounds that you can make, as well as sounds that common instruments can make, to the sounds that are made by your sound maker.
- Build skills in manipulating different materials for a particular purpose, e.g. cutting, bending, threading, re-shaping, and attaching.
- Use skills of observation during testing to consider ways of improving design.
- Increase understanding and confidence of the testing and design process; observing areas of the design that need improvement, posing a new design solution, making a change and observing the impact of that change.
- Feel and recognise success in implementing creative solutions to real world challenges. Apply this approach in everyday life.
- Express enjoyment in engaging in the challenge and sharing ideas and understandings.



Equipment

- Scissors
- Tape
- Rigid containers (we used bespoke wooden sound boxes to open up possibilities, but plastic containers or rigid cardboard boxes work fine)

Suggested Design Materials:

- Rubber bands (3 sizes)
- Paper clips
- Cardboard cups (various sizes)
- Straws (various sizes)
- Paddle-pop sticks
- String
- Paper
- Cardboard

Optional Extra Materials:

- Aluminium foil
- Chopsticks
- Clear binding cover
- Plastic beads
- Foil pans
- Balloons
- Cardboard big bowl
- Craft rolls
- Corrugated cardboard
- Assorted elastics
- Meccano
- Embroidery hoops

Stimulus and Extension Materials

- Selection of different instruments/ sound makers
- Computer or tablet/smartphone with microphone running Chrome Music Lab Spectrogram program (free website)

Design process

This activity follows a design process. Below are some questions that will help at each stage of the process.

Think of some solutions

- What sorts of different sounds can you make with your voice and body? How would you describe these different sounds?
- What sorts of different sounds can you make with different instruments and objects? How do they make different sounds?
- What ideas do you have for a design?
- What type of sounds do you want your creation to be able to make?
- Who might use this? What might they need or require?

Make a prototype

- What materials will you use to create your instrument?
- How can you use the different properties of the materials in your own design?
- What features will your instrument include? (resonance chamber, vibration source, percussive elements)
- What part of your design are you finding tricky to build?

Test it out

- Test out your design by trying to make as many different sounds as possible. For an added challenge try to use your device to control the volume and pitch of each sound.
- What can you tell just from using your ears? How can Chrome Music Lab help test the instrument?
- Were you able to make the sounds you wanted to? Could you change and control them?
- Has testing it given you any other ideas?
- What part of your design worked really well?
- What would you name the different sounds? (add the names to the sound words wall)

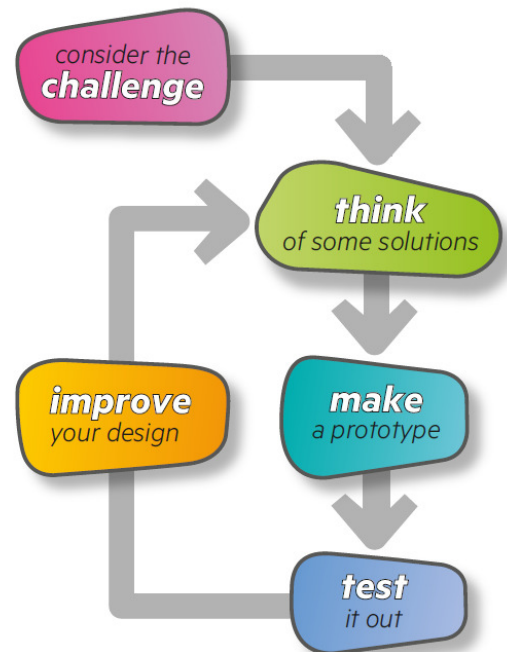
Improve your design

- How could you improve on your design?
- What could you add to change the sounds being produced or produce more sounds?
- What ideas could you incorporate from someone else's design? Talk to a friend or search online.
- If you started again, what would you do differently? What would you do the same? Create a record of your design to guide future projects.

Background science

All sound is caused by vibrations travelling in waves through a medium (e.g. air, water, soil). Most instruments have a vibration source (e.g. strings, drum membrane) to produce sound waves, a resonance chamber (large volume container full of air) to amplify the volume of these waves and a way of controlling the frequency/pitch of the sound waves they produce. For example, most guitars have a big wooden resonance chamber and the pitch can be altered by placing your fingers at different positions on the strings. The Sound Makers activity is all about exploring how materials with different observable properties can be physically changed or combined for the purpose of producing controlled sounds.

A spectrogram is a visual representation of the different frequencies/pitches of sound (and volume) over time. One free online source is Chrome Music Lab



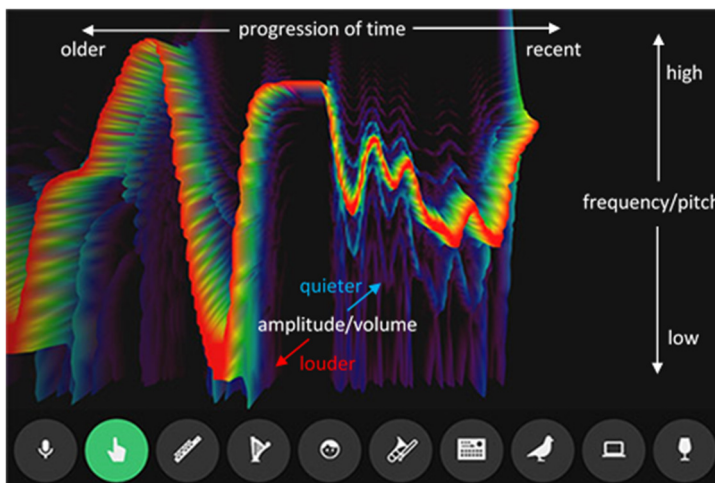
(<https://musiclab.chromeexperiments.com/Spectrogram/>). The spectrogram makes a great tool for testing the sounds produced by the sound makers, but is also a great way to start the activity. Students can play around with their voices and stimulus instruments/sound makers to see what these sounds look like on the spectrogram.

A fun way to broaden the scope of this activity is to include a “Sound Words Wall” for students to write up their own onomatopoeias. An onomatopoeia is a word that phonetically resembles the sound it describes (e.g. tick-tock, bam, splash, gargle, slap, strum, ding-dong, hum). They are an important part of human communication and exist amongst all cultures worldwide, often with huge similarities, making these words the most easily understood by people who speak different languages.

Key Search Terms: Science of Sound, Science of Musical Instruments, Chrome Music Lab Spectrogram

Interpreting a Spectrogram

The most recent sounds are shown on the right side of the spectrogram. High pitch sounds are shown at the top and low pitch at the bottom. The colour of the signal shows the volume, red is loud, green is medium, blue is quiet.



Links to Australian Curriculum

Science Curriculum:

Year	Curriculum
F	<p>Chemical sciences Objects are made of materials that have observable properties (ACSSU003).</p> <p>Physical sciences The way objects move depends on a variety of factors, including their size and shape (ACSSU005).</p>
1	<p>Chemical sciences Everyday materials can be physically changed in a variety of ways (ACSSU018).</p> <p>Physical sciences Light and sound are produced by a range of sources and can be sensed (ACSSU020).</p>
2	<p>Chemical sciences Different materials can be combined for a particular purpose (ACSSU031).</p> <p>Physical sciences A push or a pull affects how an object moves or changes shape (ACSSU033).</p>
4	<p>Chemical sciences Natural and processed materials have a range of physical properties that can influence their use (ACSSU074).</p> <p>Physical sciences Forces can be exerted by one object on another through direct contact or from a distance (ACSSU076).</p>

8	<p>Chemical sciences Properties of the different states of matter can be explained in terms of the motion and arrangement of particles (ACSSU151).</p> <p>Physical sciences Energy appears in different forms, including movement (kinetic energy), heat and potential energy, and energy transformations and transfers cause change within systems (ACSSU155).</p>
9	<p>Physical sciences Energy transfer through different mediums can be explained using wave and particle models (ACSSU182).</p>

Design and Technologies Curriculum:

Year	Curriculum
F-2	<p>Design and Technologies Explore the characteristics and properties of materials and components that are used to produce designed solutions (ACTDEK004).</p> <p>Digital Technologies Recognise and explore digital systems (hardware and software components) for a purpose (ACTDIK001).</p>
3-4	<p>Design and Technologies Investigate how forces and the properties of materials affect the behaviour of a product or system (ACTDEK011). Evaluate design ideas, processes and solutions (ACTDEP017).</p> <p>Digital Technologies Identify and explore a range of digital systems with peripheral devices for different purposes, and transmit different types of data (ACTDIK007).</p>
5-6	<p>Design and Technologies Investigate characteristics and properties of a range of materials, components and equipment and evaluate the impact of their use. (ACTDEK023).</p>
7-8	<p>Design and Technologies Analyse ways to produce designed solutions through selecting and combining characteristics and properties of materials, systems, components, tools and equipment (ACTDEK034).</p>
9-10	<p>Design and Technologies Investigate and make judgements on how the characteristics and properties of materials are combined with force, motion and energy to create engineered solutions (ACTDEK043).</p> <p>Investigate and make judgements on how the characteristics and properties of materials, systems, components, tools and equipment can be combined to create designed solutions (ACTDEK046).</p>

Images

