



ACTIVITY: Musical Instruments

ACTIVITY OVERVIEW

We take it for granted that different musical instruments make different sounds, but have you stopped to think about the materials and design process involved in making these wonderful sounding objects? Materials can make a big difference to sounds produced. We see a simple example of this when we hit a wooden spoon on a metal pot, compared to hitting the spoon on a plastic lunchbox. Sound travels through vibrations, making materials crucial in the design of musical instruments, as sound will travel differently through different materials. Many musical instruments we use have been developed and improved over time by musicians and designers.

In this activity, students work together to design and build a musical instrument made from recycled materials, working through both the 'Generate' and 'Produce' parts of the design process.

SYNOPSIS

We take it for granted that different musical instruments make different sounds, but have you stopped to think about the materials and design process involved in making these wonderful sounding objects? Materials can make a big difference to sounds produced. We see a simple example of this when we hit a wooden spoon on a metal pot, compared to hitting the spoon on a plastic lunchbox. Sound travels through vibrations, making materials crucial in the design of musical instruments, as sound will travel differently through different materials. Many musical instruments we use have been developed and improved over time by musicians and designers.

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Foundation – Year 2

- Explore the characteristics and properties of materials and components that are used to create designed solutions (VCDSTC017)
- Visualise, generate, and communicate design ideas through describing, drawing and modelling (VCDSCD019)
- Use materials, components, tools, equipment and techniques to produce designed solutions safely (VCDSCD020)
- Light and sound are produced by a range of sources and can be sensed (VCSSU049)

Year 3 – 4

- Investigate the suitability of materials, systems, components, tools and equipment for a range of purposes (VCDSTC027)
- Generate, develop, and communicate design ideas and decisions using appropriate technical terms and graphical representation techniques (VCDSCD029)
- Select and use materials, components, tools and equipment using safe work practices to produce designed solutions (VCDSCD030)

Year 5 – 6

- Investigate characteristics and properties of a range of materials, systems, components, tools and equipment and evaluate the impact of their use (VCDSTC037)
- Generate, develop, communicate and document design ideas and processes for audiences using appropriate technical terms and graphical representation techniques (VCDSCD039)
- Apply safe procedures when using a variety of materials, components, tools, equipment and techniques to produce designed solutions (VCDSCD040)

ACTIVITY, MATERIALS AND INSTRUCTIONS

Activity – Recycled Musical Instruments

Explore sound, vibrations, and materials by designing and creating your own recycled musical instruments.

Materials (for class of 30 students)

- Assorted recycled materials made from different materials, including cardboard and plastic (e.g. shoe box, tissue box, milk bottle)
- Rubber bands (assorted bag full)
- Extra craft materials, including pencils, icy pole sticks, string
- Scissors

Instructions

1. Students work in groups of two or three.
2. Teacher to play video clip for Ok Go's song, Needing/Getting (<https://okgosandbox.org/needing-getting>) to get students excited about making music and thinking about unconventional instruments.
3. Teacher demonstrates how to make a shoebox guitar:
 - cut hole in centre of shoebox lid
 - stretch rubber bands around box
 - slide pencils (or icy pole sticks) under the rubber bands, so that the rubber bands do not touch the cardboard
4. Students use recycled materials, plus rubber bands and craft materials to create their own instruments.

The instrument should have:

- vibrations (to make sound)
- a part that makes the sound louder
- some way of changing the sound (making different notes)

Students will need to think about which materials they use and how to play their instrument.

5. When design and construction are completed, students show others their instruments.
Time permitting, extend this activity by encouraging students to work in larger groups with more instruments.
6. Join small groups together to form groups of five or six students. Each group puts together a musical performance to show their classmates. To provide inspiration for more music-making, show students the 'Surrounding Sounds' video clip from Ok Go (<https://okgosandbox.org/needing-getting/surrounding-sounds>). This video shows the band members making music using objects from a school classroom, house, and playground.
By adding sounds from your location to the student-designed instruments, there will be enough instruments for all students to be involved (e.g. shoebox guitar added to drumming on the slide, plus banging different parts of the monkey bars). Students could record their performances to produce their own music videos.

HOW TO USE THIS ACTIVITY WITH YOUR STUDENTS

Foundation – Year 2

This activity combines the study of materials, learning about the design process and the physics of sound.

Investigate

Introduce this activity to these students by exploring the topic of sound. How does sound travel from an instrument to our ears?

Sound travels through vibrations. The air molecules bump into each other, transferring the vibration from its source to our ears. So, a musical instrument will need to make vibrations.

Generate

Students work together to turn the recycled materials into musical instruments. During construction time, students experiment with sounds produced by different combinations of materials. To assist younger students, they could all be instructed to make box guitars, using a cardboard box with rubber bands.

Produce

Ask students to bring in an old shoebox from home (perhaps even ask the wider school community). Show students a teacher-made demonstration shoebox guitar.

Students follow instructions to make their own recycled instruments. What part is vibrating? Where is the sound travelling in the instrument? Join all of your shoebox guitars and form a band! Maybe you can provide music to accompany different parts of your next school assembly (e.g. announcing the house points, giving out awards, speech from the principal).

Years 3/4

The focus of this activity for students in Year three and four is exploring materials that musical instruments are made from, generating ideas for creating new instruments from recycled materials, and producing a new musical instrument.

Investigate

Introduce the activity to your students by exploring musical instruments found at your school. What materials are they made from? Do any students play instruments? What are they made from? Musical instruments can be made from anything that will vibrate and play sounds loud enough for others to hear.

Generate and Produce

Students work together to turn the recycled materials into musical instruments. During construction time, students experiment with sounds produced by different combinations of materials, looking for the most interesting vibrations and probably the loudest sounds!

Years 5/6

Year five and six students come to this activity with the focus on investigating properties of materials used in musical instruments, generating ideas to make different sounds, and producing a new instrument from recycled materials.

Investigate

Introduce this activity to your students by playing some popular music for the students. If you are not familiar with what's popular today, visit the ARIA (Australian Recording Industry Association) website and choose a few songs from the Top 50 Singles (<https://www.aria.com.au/charts/>). What instruments can you recognise playing in these songs? What materials are used to make these instruments? An instrument must have a part that vibrates, plus a part that makes the sound loud enough for others to hear. Which part of the instrument vibrates?

Generate and Produce

Students work together to turn the recycled materials into musical instruments. During construction time, students experiment with sounds produced by different combinations of materials, looking for the most interesting vibrations and probably the loudest sounds! This activity will also highlight group work, important in the design process.

Note – if you wish to focus on other areas of the design process, you can easily modify this activity. For more focus on investigation, spend

more time studying existing musical instruments. For more focus on evaluation, ask students to review one another's instruments and suggest improvements, redesign instruments to play a recognisable tune (e.g. 'Mary Had a Little Lamb' needs only three notes).

DISCUSSION SECTION AND KEY THEMES

KEY THEMES

Sound

Sound waves (vibrations) travel into our ears – outer ear (ear lobe, ear canal), middle ear (ear drum, hammer, anvil, stirrup), inner ear (cochlea – shaped like a snail), and finally into our brain. The bang-e-ty, bang-e-ty sound vibrations make the ear drum go bang-e-ty bang-e-ty, which makes the hammer, anvil, and stirrup go bang-e-ty, bang-e-ty. These waves are sent to the cochlea, where special cells transmit the information to the brain, where sounds are then distinguished. The three bones in the middle ear are the smallest bones in our bodies.

Sound waves are longitudinal waves. Their vibrations occur in the same direction as the direction of travel. They are produced by vibrating sources, such as speakers. A vibrating object transfers kinetic (movement) energy to the particles surrounding it through an alternating series of pushing and pulling on the particles. The continuous forward and backward bumping of particles results in transferring of energy to neighbouring particles. Sound waves can only travel through a medium. They cannot travel through a vacuum. The medium can be in a solid, liquid, or gas state. They travel fastest in solids, then liquids, and slowest in gases. A slinky is often used to model sound travelling.

The sound of string instruments is produced by vibrating the strings (finger plucking or gliding a bow across) on top of the hollow instrument body.

Materials

Wood – Some of the earliest musical instruments used by people were made from wood, including clapsticks and didgeridoos used by Aboriginal and Torres Strait Islanders. Wood is a suitable material for musical instruments because it has always been readily available, easy to shape and long lasting. The body of stringed instruments is made from wood, as the sound vibrations travel well through this material. Another plant material, bamboo, is used to make pan pipes and simple flutes. Oboe, clarinet and bassoon are still made from wood, with the reed piece made from cane. Flutes used to be made from wood but are now usually made from metal.

Metal – Bronze (copper + tin) became a popular material for musical instruments. Bronze can be melted and cast into different shapes relatively easily compared to other metals. Percussion instruments, including bells, cymbals and gongs, were all made using bronze. Brass (copper + zinc) can be melted and shaped into tubular, flared shapes, like shells, and is still used to make trumpets, trombones, tubas and French horns today. Saxophones can be made from brass or bronze. Due to its simpler cylindrical shape, flutes are now made from silver-plated copper-nickel alloy. Top-quality flutes can even be made, by hand, from gold!

Animal parts – Early drums were made by stretching animal skins over a frame. These are now made using types of plastic. Animal gut used to be used for stringed instruments (e.g. guitar, violin), but strings are now made from synthetic polymers (e.g. nylon) and steel. Shells were used as early wind instruments, as blowing through a hole in the narrow end can create a loud trumpet-like sound.

Parts of a stringed instrument

Strings – originally made from sheep gut (called catgut), mostly nylon and steel strings now. Guitars have six strings. Violins, violas, cellos, and bass all have four strings.

Bow – made from horsehair and wood (used to glide across the strings).

Body – made from wood (e.g. maple), main part of the instrument, hollow, amplifies the sound made by the strings.

Fingerboard – the part where you press your fingers onto strings to change the pitch of the note, found on the neck.

Neck – long part of string instrument, where strings are found.

Tuning pegs – strings are wound around these, then turned to tighten, or loosen the string and change the pitch of note played.

Frets – small bumps on the neck of a guitar, spaced precisely to create the music scale.

Holes – violins have f-shaped holes, guitars usually have circular holes. These holes are where the sound comes out of the instrument body.

Bridge – small piece of wood that transmits vibrations from the strings into the body of the instrument.

Music notes

The names that we give notes, and the way that we show them positioned on a sheet of music have been used for around 1000 years. An Italian monk, Guido D'Arezzo, started the music notation that we know and use today, with notes placed at different positions on a staff. This means that today's musicians can easily play music written from hundreds of years ago without any difficulty. Amazing!

QUESTIONS AND ANSWERS

What musical instruments do Aboriginal and Torres Strait Islander people play?

The most famous Australian instrument is the didgeridoo, a hollow tree

trunk. You blow air into one end of the trumpet-like instrument, to produce a droning sound. Didgeridoos provide rhythm for music.

Clapsticks are another popular Indigenous Australian instrument. The sticks provide rhythm for music, with sounds made by striking pieces of wood together.

How do I tune my instrument?

Stringed instruments are tuned by tightening or loosening the strings. For example, violins and guitars have tuning pegs with the strings wound around them.

When you turn the tuning pegs, you can raise or lower the pitch of the note played by that string. With our rubber band guitars, the pitch can be changed by moving the pencils to shorten or lengthen the section of rubber band being plucked, or by shortening the rubber bands.

Do people still make instruments by hand? or are they all made in factories?

Some instruments are made by machines in factories (e.g. the recorders used in your music room at school). But there are still many instruments made by skilled craftspeople by hand, especially high-quality instruments for professional musicians. For example, Maton makes guitars by hand in a factory in Box Hill, Melbourne. A luthier is a person who makes and repairs string instruments. Some skills that are useful to luthiers are woodworking, good listening skills and musical experience.

Why are there holes in string instruments?

The hole is found in the wooden body of the string instrument and is where the sound vibrations leave the instrument and travel through the air towards the audience. The position and size of the hole affects the

sound produced by the instrument. Violins traditionally have f-shaped holes, while guitars have round holes. The hole faces outwards, so that the sound travels forwards in the direction of the audience, rather than back towards the musician. The hole helps to make the instrument sound louder, to amplify it, by taking all the vibrations from the whole wooden body and causing them to leave through one smaller hole.

What are the different instrument sections in an orchestra?

Strings – made of wood, hollow chamber, strings stretched tight, sound produced by strings vibrating (violin, viola, cello, bass). Why no guitars in an orchestra? Mostly because they are too quiet to be heard in amongst all the other instruments (unless amplified).

Woodwind – blow into mouthpiece, finger holes on body (flute, clarinet, oboe, bassoon).

Brass – metal instruments, buzz your lips against the mouthpiece plus tubing amplifies the sound (trumpet, trombone, French horn, tuba).

Percussion – playing the beats, rhythm, instruments that you hit in a certain way (cymbals, timpani, xylophones, triangles, drums).

What are some examples of instruments made from unusual materials?

People have made musical instruments from a variety of natural and synthetic materials. Would you like to play a narwhal horn flute or a human thighbone trumpet?! This website shows a collection of strange instruments and includes video clips of musicians playing these - www.thecapitoltheatre.com/blog/detail/20-of-the-weirdest-musical-instruments-you-need-to-see-to-believe.

Are there any instruments you play that don't use your mouth or fingers?

There are a variety of musical instruments that can be played just with your feet.

Foot drums – the bass/kick drum in a drum kit, operated by a foot pedal.

Foot tambourine – slides over your shoe, with tambourine sitting on top. When you tap your foot, the tambourine sounds.

Foot cabasa – cabasa (loops of steel ball chain around a cylinder), attached to a foot pedal that rotates when you press your foot.

Ankle bells and foot rattles – are attached around ankles and sound when you move your foot.

People with arm disabilities are often able to play instruments using their feet instead of hands.

What happens in your brain when you hear music?

Scientists have studied what is happening in our brains when we hear music. The University of Central Florida website has an interactive brain diagram, showing the different parts of the brain activated when listening to music. Researchers are particularly excited by the response of Alzheimer's patients to music that triggers memories and emotions from their past, despite being unable to remember things from the present day.

<https://www.ucf.edu/pegasus/your-brain-on-music/>

Other brain research has shown that listening to music can reduce anxiety, blood pressure and pain. Music can also improve mood, mental alertness, memory, and sleep quality. Music is sometimes described as providing a whole-brain workout!

Do animals like listening to music?

Perhaps you have tried to calm down a nervous dog with an online doggy tunes playlist? There are many studies that have been done on animals listening to music. These include playing classical music to milking cows, piano to elephants, special high-frequency music for cats, monkeys listening to popular music, classical music for dogs and soothing music for rabbits. In Thailand, you can even hear an elephant orchestra perform! Perhaps animals don't enjoy human music as much as we do, but there are certainly some types of music that appear to be beneficial to different animals.

What other instruments can I make at home?

There are lots of fun instruments you can make at home using easily sourced items. Some suggestions include straw panpipe, balloon drum, paper plate tambourine, rubber band cup, icy pole stick harmonica, hand drum, glass jar xylophone, rainmaker, kazoo, bobby pin thumb piano or water bottle membranophone.

OUTSIDE OR SUPPLEMENTARY READING

Musical instruments you can make at home

- <https://www.learningliftoff.com/make-homemade-music-with-these-6-diy-instruments/>
- <https://feltmagnet.com/crafts/Music-Instruments-for-Kids-to-Make>
- <https://tinybeans.com/homemade-instruments/slide/4>

What is music notation?

- <https://www.masterclass.com/articles/music-101-what-is-musical-notation-learn-about-the-different-types-of-musical-notes-and-time-signatures#what-is-musical-notation>

How musical notation was invented

- <https://www.wqxr.org/story/how-was-musical-notation-invented-brief-history/>

Aboriginal and Torres Strait Islander musical instruments

- <https://australiancurriculum.edu.au/TeacherBackgroundInfo?id=56578#:~:text=Aerophone%20musical%20instruments%20constructed%20by,and%20Torres%20Strait%20Islander%20Peoples>

Materials and musical instruments, Neville Fletcher, ANU

- https://www.acoustics.asn.au/journal/2012/2012_40_2_Fletcher.pdf

TOPIC WORDS

- Music
- Instrument
- Materials
- Properties
- Sound
- Vibration
- Musician
- Amplify
- Pitch
- Tune



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