Rocks music
Create your own geo-instrument

Since prehistoric times, it has been known that rocks can make musical notes when struck. Quarrymen know that if a block of rock 'rings' when it is hit then it is good and usable. If it does not, it has a crack in it.

From Neolithic times, about 12,000 years ago, people have used rocks and stones to make musical instruments. These are called lithophones. (*Greek: lithos-rock, phone-voice*). Prehistoric lithophone stones have been found in many countries, especially in Asia.

The lithophones vary in style, from suspended rocks to rocks placed together horizontally. Originally the striker would have been bone, wood or another stone. If the stones are arranged like a xylophone, the instrument is called a marimba.

Ask the pupils to investigate examples of lithophones. Some examples are given below.
A very simple type of lithophone is the 'rock gong', as shown in photo 1. There are many examples of rocks being struck to make musical notes, e.g. the chimes shown in photo 2 or 'Ringing Rocks Park' in Pennsylvania.

Photos 3 and 4 on page 2, show more complicated instruments.

The Icelandic rock band, Sigur Rós constructed a slate marimba from local rocks.
https://www.youtube.com/watch?v=tmLXrNGhmPM

Secondly, ask the pupils to work in groups to make lithophones. Tell them to use any of the rocks and stones provided and to experiment.

- are the rocks best suspended or laid horizontally?
- if placed horizontally, do they need to be lifted up on to something, like pieces of wood?
- should the rocks be arranged in order of size to make a sequence of notes?
- what is the best striker, wood, metal or something else, to hit them with?
- should the lithophone be made of similar rocks or can they be mixed up?
- which rocks make the most pleasing sounds?

As the pupils work, they may think of other variables. They should make a note of their trials and why they reached their final conclusion. Recordings can be made of music played on their lithophones.

An example of a home-made lithophone using suspended pieces of slate *Elizabeth Devon*

The photo above shows that the children have tied the chosen rocks (slates) on to the pole with string making sure they can be removed easily and the positions of the slates changed. They tried placing the slates flat on the ground on pieces of wood but the stones did not ring as well as when they were suspended. They found the metamorphic slate made a better musical sound than the sedimentary sandstone or igneous dolerite. A recording of the sound made by their lithophone can be heard here:- https://www.earthlearningidea.com/Sound/Lithophone.html

Photo 1
Ethiopian Lithophone, Monastery of Naâđakuto Laâđab
A. Davey

Photo 2
Chime Set. Shandong Provincial Museum, Jinan. Chime sets were important ritual and court instruments, in the bronze age and later.
Michael Gunther

Photo 3 The Musical Stones of Skiddaw, Keswick Museum UK

Photo 4 Great Stalacpipe Organ, Luray Caverns, Shenandoah National Park, Virginia, USA. Stalactites of varying sizes are tapped with solenoid-actuated rubber mallets in order to produce tones. It is played on an organ-style keyboard console. Leland W. Sprinkle (1956) *Photo by Jon Callas*

The back up:

Title: Rocks music

Subtitle: Create your own geo-instrument.

Topic: Making music has always been important to people. This activity encourages pupils to investigate musical instruments made from rocks or pebbles, and to create their own. The activity creates a cross-curricular link between the sciences and arts.

Age range of pupils: 5 years upwards

Time needed to complete activity: 30 minutes for the class explanation and research but much longer to create the musical instrument.

Pupil learning outcomes: Pupils can:

- appreciate that music can be made from material from the natural world, e.g. rocks, minerals;
- make lithophones or marimbas which are percussion instruments;
- compose pieces of music for the instrument;
- realise that different rocks of different shapes and sizes will make different sounds when struck;
- determine which rocks in one of the three groups, sedimentary, igneous or metamorphic, make the most musical sounds;
- appreciate that everyone can make an instrument to create music.

Context:

The pupils should be able to identify the rocks they use and should be able to say whether they are sedimentary, igneous or metamorphic.
This activity fits in well at the end of a topic where pupils can explore other aspects of the subject of study. It encourages creative thought and breaks down barriers pupils may make between scientific subjects and the arts.

Following up the activity:

Pupils can use search engines to explore the topics 'Musical instruments made from rocks'.They could also try the other Earthlearningideas in this series, (listed in a table at the end).

Underlying principles:

- Making music from whatever is available has played an important rôle in our lives since ancient humans lived in caves.
- Rocks vibrate when hit. These vibrations generate mechanical waves of pressure which displace the surrounding air and create sound. The resonant frequencies of the rocks are notes.
- Experiments have shown that for blocks of constant thickness, the resonant frequency is a function of length, where the width is kept constant, and a function of width where the length is kept constant.
- Thin specimens will transmit vibrations in the air more easily than thick ones.
- The resonant frequency is a function of the velocity of sound in the rock and of its stiffness, both being related to density. Generally, the higher the density the higher the pitch of the sound.
- Specimens with a non-parallel arrangement of 'layers' within the rock will not work well, if at all, because the resonant frequency changes constantly and waves cannot propagate.
- The shape of the sound wave depends on which frequencies are present and on the ratio between the amplitudes of the sound wave frequencies. The wave form is described as the timbre of the musical instrument.
- The most effective lithophones are likely to be made of rocks which are thin and parallel-sided and where the length and the width have a simple

numerical relationship, (e.g. length two times width or three times width etc.) so that the harmonics reinforce the overall sound.
- The interactions of the three dimensions of a cuboid specimen governing the resonant frequency are not well understood. If the rock is anisotropic, i.e. its properties are not the same in all directions, it is extremely difficult to make any analysis.

Thinking skill development:
Making a musical instrument by trial and error shows construction. Discussion about the instrument involves metacognition. Making rocks into a musical instrument which can then be played is a bridging skill and is the aim of the activity.

Resource list:
- supply of suitable rocks and pebbles, sedimentary, igneous and metamorphic. It is helpful if some have holes drilled into them
- variety of wooden, metal and stone strikers; drum sticks are ideal
- pieces of wood e.g. broomsticks, to be used to make supports or for bases for marimbas
- string and scissors
- access to the internet (optional).

Useful links:
https://en.wikipedia.org/wiki/Lithophone

Source: Elizabeth Devon of the Earthlearningidea Team

Cross-curricular Earthlearningideas
Geo-art: paintings and sculptures inspired by all things 'geo'
Earthquakes and art: historic paintings of earthquakes
Geo-literature: poems and stories inspired by all things 'geo'
Geo-music: music inspired by all things 'geo'
Rocks music: create your own geo-instrument
Back in time: "Alligators spotted in London"