Primary Science & Technology *Bulletin*

Ideas and inspiration for teachers in Primary Schools and S1/S2

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Sounds good!

Exploring the nature of sound forms an important part of the study of the sciences within *CfE* [1]. The sub-organiser *Vibrations and Waves* outlines experiences and outcomes to be addressed at Early, First, Second and Fourth levels, which together form line of development *SCN 11a*.

Figure 1 *- African Djembe.*

In addition the *Concept development in the sciences* paper, published by Education Scotland [2], provides material for teachers to use alongside the experiences and outcomes as they plan for the development of learners' scientific knowledge, understanding and skills.

Musical instruments provide an ideal opportunity for learners to explore sounds, often through play. Instruments can be purchased or borrowed but providing learners with a chance to make their own instruments facilitates the investigation of different sources of sound and can lead to the recognition of some differences in the sounds produced. A variety of ideas for shakers and tambourines can be found on Education Scotland's STEM Central [3], [4], [5].

This article will provide ideas for making simple and cost effective instruments using a variety of easily obtainable materials. Full instructions for each instrument are available on the SSERC website by following the links provided. As the instruments are plucked, blown, banged or strummed, learners should be encouraged to observe that the sounds produced originate from vibrations e.g. by plucking a guitar string or beating a drum such as the one pictured (Figure 1), based on the traditional African Djembe [6].

The clucking cup (Figures 2 & 3) is a popular musical toy and very easy to make using a plastic cup and length of string [7]. Once the string has been threaded through a hole (safely made in the bottom of the cup by an adult) and secured (Figure 2) you should hold the clucking cup at the base with one hand. Take a small piece of cloth and hold it around the length of string near the top of the cup with your thumb and index finger. Now pull the cloth firmly along the string to make the cup "cluck". The noise made can sometimes sound like a bark or a screech (in which case a dog or Hallowe'en themed decoration may be more appropriate).

You can pull the string gently but firmly with your fingers to get a similar effect (Figure 3). Learners could compare what happens if the cloth (or hand) is wet when pulled along the string or if the thickness/ texture of the string is changed.

The friction caused by pulling the cloth (or fingers) along the string makes it vibrate and these vibrations produce a faint sound. However in this case the cup and air around it also vibrate so the sound is made loud (amplified) enough for us to hear it. Some of the sound effects

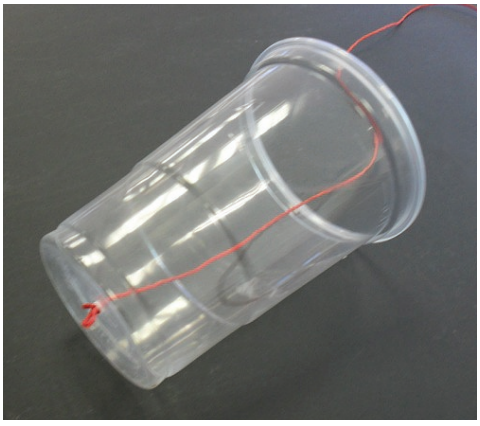

Figure 2 *- Clucking cup.*

Figure 3 *- Decorated clucking cup.*

Figure 4 *- Flazoot.*

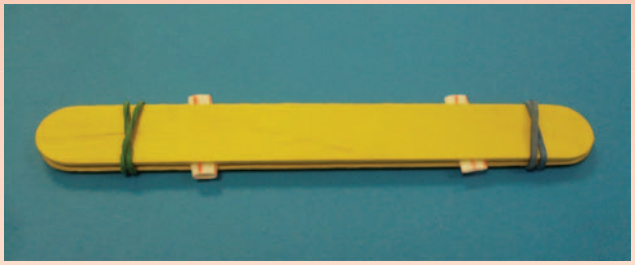

Figure 5 *- Kazoo.*

produced are quite astonishing! For a more ambitious clucking cup the cup could be replaced by a large plastic flower pot.

Vibrations can be difficult to see when playing instruments such as a recorder, where air is made to vibrate in the mouthpiece. Making an instrument where the vibrations can be seen and felt as well as heard can make these vibrations more obvious to learners. Two such instruments are the Flazoot (Figure 4) and Kazoo (Figure 5).

Once you have made your Flazoot [8] put your lips up to the hole and gently blow across the tube, not into it! You should feel the stretched balloon vibrate and hear a sound.

Once you can produce a continuous note you can try changing the pitch of the note by pressing your fingers into one or other of the balloons at each end, then try pressing on both ends. Different notes are made as you change the amount of air inside the instrument, thereby changing the pitch of the note. In the same way different notes are made on the recorder by covering or uncovering different finger holes as you play.

The Kazoo is made from jumbo lolly sticks, elastic bands and a straw [9]. Once you have assembled your Kazoo hold it so that the gap between the lolly sticks is between your lips then blow. Once you have got the elastic band inside the lolly sticks vibrating and producing a continuous note, you could try moving the straws 4 cm from each end of the lollipop stick and blow as before. Learners can explore and perhaps record what happens to the pitch of the note as they change the position of straws in relation to the ends of the Kazoo. If you substitute the lolly sticks for two 30 cm transparent plastic rulers you should be able to see the elastic band vibrating as you play this version of the Kazoo.

The link between changes in pitch and vibrations can be further explored by changing the tension of the vibrating length of a string - this can be demonstrated using a Baking Tray Banjo (Figure 6) [10].

Learners could be encouraged to listen out for the different pitches produced by these instruments and how the pitch can be changed. If the pitch is altered the sound will either become lower or higher. Learners should be able to hear that the shorter, tighter or thinner the string the higher the pitch of the note produced - just as reducing the amount of air in a woodwind instrument will produce a higher pitched note.

The New York Philharmonic website has a fantastic selection of ideas for making more instruments in their "instrument lab" [11]. If you are looking for a way to link your school garden to your sound topic then the University of Southampton has a section on its website entitled Growing Sound [12] with instructions for making a range of instruments from fruit and vegetables.

Health and Safety advice

- Ensure that learners do not become faint due blowing into the instruments for extended periods.
- Ensure junk modelling materials are clean, appropriate and safe to use.
- Do not use toilet roll inserts for the Flazoot activity.
- Blow through clean individual straws - don't share straws with others.
- Be aware of latex allergies - some people with severe latex allergies cannot even be in the same room in case a balloon bursts and scatters latex powder.

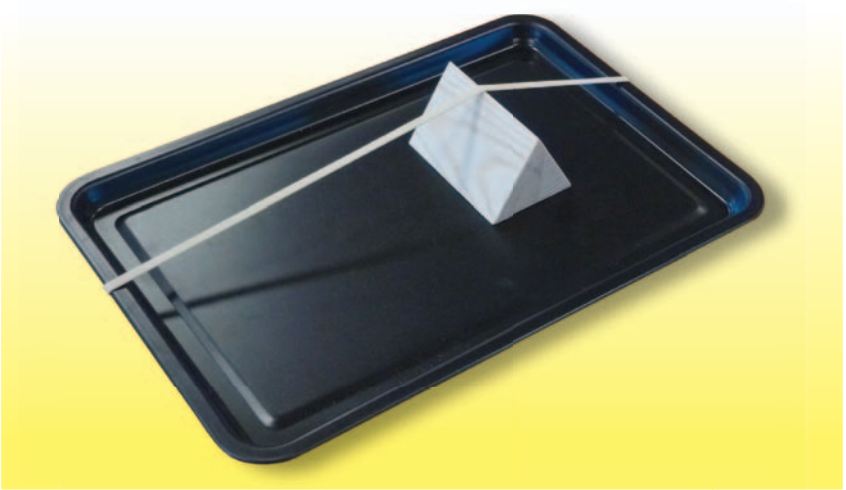

Figure 6 *- Baking Tray Banjo.*

Figure 7 *- Vocal cord model.*

At second level learners will explore the concept of the transmission of sound by waves in solids, liquids and gases. Toy telephones made from two cups and a piece of string demonstrate that sound waves are able to travel through the string, cup and skull to reach the ear. Learners could also carefully tie one end of a piece of string round a metal spoon, loop the other end of the string over the ear and listen to the sound produced when the spoon is struck with another metal object. Don't allow learners to strike the object too hard though. Sound actually travels most effciently through solids [13].

Learners could think about how animals make sounds. Carefully stretch a thick elastic band over a plastic mug and use a wide straw to blow air directly over the band (Figure 7) the band vibrates and makes a sound. Learners could relate this to how our vocal chords work. Learners can feel the vibrations made as they talk by gently pressing their fingers against the base of their throat whilst talking or singing. The vibrations feel stronger when a louder sound is made.

Learners may be able to explain how sound is detected by the ear and should be given the opportunity to research the importance of sound as a means of communication between animals. Learners could research how dolphins and other marine animals communicate and start to understand that sound must travel through liquid for the dolphins to be able to communicate.

At fourth level learners develop an appreciation that the appearance of wave patterns, often observed on an oscilloscope, can be linked to changes in the pitch, volume and tone of sounds from different sources. ICT, especially in the form of digital audio editors, can be used to enhance the learner's experience. Software, such as Audacity, has been featured in a number of past editions of the SSERC Primary Bulletin see Bulletin Number 48 [14] for more details.

Each sound has a particular pitch. The number of waves produced per second are fewer for a low pitched sound and greater for a higher pitched sound. The number of waves produced each second is called frequency.

Learners should understand that change in the pitch of a note (frequency) is not the same as a change in volume (amplitude).

- Through play, I have explored a variety of ways of making sounds - *SCN 0-11a*.
- By collaborating in experiments on different ways of producing sound from vibrations, I can demonstrate how to change the pitch of the sound - *SCN 1-11a*.
- Through research on how animals communicate, I can explain how sound vibrations are carried by waves through air, water and other media - *SCN 2-11a*.
- I can identify my senses and use them to explore the world around me - *SCN 0-12a*.
- I have explored my senses and can discuss their reliability and limitations in responding to the environment - *SCN 1-12b*.
- I have explored the structure and function of sensory organs to develop my understanding of body actions in response to outside conditions - *SCN 2-12b*.

- I have the freedom to use my voice, musical instruments and music technology to discover and enjoy playing with sound and rhythm - *EXA 0-17a*.
- I can use my voice, musical instruments and music technology to discover and enjoy playing with sound, rhythm, pitch and dynamics - *EXA 1-17a*.
- I can use my voice, musical instruments and music technology to experiment with sounds, pitch, melody, rhythm, timbre and dynamics - *EXA 2-17a*.

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