

Grade 4 Music Monday

Exploring The Science of Sound Through Instrument Invention

Outcome: CP4.5

Demonstrate increased skills and abilities in the use of voice and instruments (traditional and/or homemade) and develop compositions using Saskatchewan as inspiration.

Outcome: SO4.1

Explore natural and artificial sources of sound in the environment and how those sounds are detected by humans and animals.

Outcome: SO4.2

Draw conclusions about the characteristics and physical properties of sound, including pitch and loudness, based on observation.

- I. Provide students with an assortment of materials and adhesives such as objects in the attached sample list. Found objects and recyclable materials are also recommended for this project.
- II. Discuss with students how musical sound is created using the information attached below and found at:
http://www.bashthetrash.com/Instruments_Intro/How_Instruments_Work_-_Easy.html
- III. Students can work in small groups or individually to invent their own instrument.
- IV. Students should present their invented instrument to the class and be able to describe the following aspects:
 - a. What sound it makes
 - b. How the instrument creates sound
 - c. Students should be able to use terms such as vibration, air, length, shape, etc. to describe their instruments.

How Musical Instruments Work

Like all interesting things, the deeper you go into instrument building the more complex it gets.



But to get started toward understanding instruments you need to know about **four things**:

- **Vibrations**
- **Types of Instruments**
- **How to build louder instruments**
- **How to get different pitches**

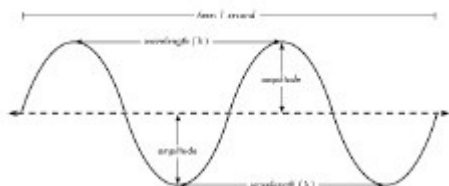
Vibrations

On all musical instruments something has to **VIBRATE** (shake back and forth). The thing vibrating might be a string, drum head, xylophone bar, a tube filled with air, whatever.

Here's how it works:

First the player has to make something vibrate - pluck or bow a string, hit the drum head or xylophone bar, buzz or blow into a tube filled with air...

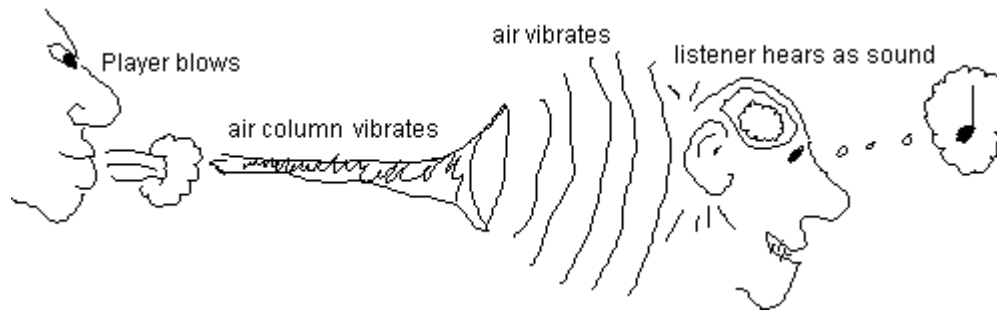
Vibrations are contagious, so the air around the



vibrating thing *also* vibrates, spreading outward in the form of **sound waves**.

The sound waves hit our ears and we hear the sound. (Actually a pretty complicated process involving the various parts of the ear and the brain.)

Take a look at the example below: *The player blows the wind instrument, which causes a column of air inside the instrument to vibrate. This in turn causes the air outside of the instrument to vibrate in the form of sound waves. The sound waves strike the listener's ear and the brain interprets the vibration as sound.*



Instrument Design

As instrument builders we can get all kinds of different sounds from our instruments by thinking about:

- **what is vibrating** (string, drum head, etc.)
- **how it is played** (bowed, struck, blown, etc.)
- **structure** - how the instrument is built, which affects:
 - getting it louder** (putting it on a box, adding a cone, etc.)
 - getting different pitches** (longer/shorter, tighter/looser, etc.)



Put all those things together and you have the unique sound (or “*timbre*”) of a particular musical instrument, whether it be a cello or a soup can hit with a pencil.

Types of instruments

Most of us were taught the traditional Western instrument families: Brass, Percussion, String, and Woodwinds. However when building instruments (or learning about instruments from other cultures) it is better to think about what vibrates:

1. **-Strings**
2. **-Air** (flutes, horns and reeds and some others)
 - **Thinly stretched stuff** (like drum heads)
 - **Solid stuff** (like xylophone bars, cymbals, etc.)

Once you know what kind of instrument it is (that is, what is vibrating), then you can make some other design changes to help your instrument sound better.

Getting it louder:

One way to play louder on your instrument is just to blow harder, hit harder, etc. But there are some tricks of instrument construction to ensure that you will be heard!

Strings - put it on a box (also called a “resonator”). Wrap your rubber band around a box (cardboard is ok, styrofoam is better), touch your tennis racket guitar to a styrofoam cooler.

Air - With horns (like buzzed cardboard tubes) and reeds (like straw oboes) you can put a cone at the end (note that the cone doesn't work as well when you have tone holes in your straw). Cones also don't work with flutes (like blown bottles).

Thinly stretched stuff (like drum heads, balloons, latex gloves, mailing tube covers, etc.) need to have something to stretch them over - like big cardboard tubes.

Solid stuff - there are so many different types of these instruments that it is difficult to know where to start. But here are a few simple strategies:

1. -With *shakers*, use small heavy stuff such as pennies, and put them in a metal container
2. -With *scrapers*, make sure the thing being scraped is rather thin, or hollow (like a coffee can)

- With *pieces of pipe, wood, etc.* it is always a struggle to allow them to vibrate. The easiest thing to do is to place them on a big styrofoam box or styrofoam pieces. Another possibility is to use strips of foam rubber.

Getting different pitches

Strings - two different possibilities: **tighter-looser** (like using the tuning pegs on a guitar) or **longer-shorter** (like putting your fingers down on the strings).

Air - two different possibilities - **longer-shorter** (like tone holes on the instrument), and **“overblowing”** (on certain blown shapes you can get a series of higher pitches by blowing/buzzing harder or faster)

Thinly stretched stuff - mostly **tighter-looser** (stretch it tighter and the pitch gets higher) but also could be affected by the **shape and length of the supporting structure**.

Solid stuff - shakers, scrapers, pipers, and pieces of wood - in all these cases **size** matters. The bigger the thing the lower the pitch.

Musical Instrument Building Sample Supply List:

(All of the below items can be found at Home Depot and Dollar Stores)

Hardware/Objects:

Buckets or Pails (various sizes)

Nails

Vinyl Tubing (diameter size must be suitable for making a buzz sound through it)

Sump Pump Drain Hose

Beans (various)

Straws

Kitchen Funnels

Styrofoam Balls

Chenille Sticks

Wooden Dowels (small – suitable for making sticks or mallets)

Steel Mixing Bowls

Small plastic containers (ie: medicine bottles – suitable for making shakers)

Wooden spoons

Surgical gloves

Paint stir sticks *

Scraps of wood *

Tools:

Pliers

Scissors

Handsaw

Wrench

Rubber Mallet

Screwdrivers

PVC Tube cutter

Adhesives:

Masking Tape

Duck Tape

Twist Ties

Craft Wire

Cord

String

Glitter Glue

Rubber bands

Pipe Cleaners

Decorations:

Stickers

Feathers

Ribbon

Markers

Googlie Eyes

Glow sticks

*Donated by Home Depot