

EXPLORING PITCH & FREQUENCY

HOMEMADE "RECYCLED" INSTRUMENTS INSPIRED BY CHINESE INSTRUMENTS

ART, MUSIC, & SCIENCE
GRADES: 2 - 5

BASED ON

DIZI (TRAVERSE FLUTE), Late 19th Century
China
bamboo, bone or ivory
Gift of William H. Doane, 1914.90

YUEQIN (MOON LUTE)
China
wutong wood, other woods, soft stone, ivory or
bone, possibly boxwood, metal
Gift of William H. Doane, 1919.170

HANGING BOSSED GONG
China
copper alloy, wood, paint
stand: 43 11/16 x 33 3/4 x 16 1/8in. (111 x 85.7 x
41cm); gong: W. 1in. (2.5cm), 22 1/16in. (56cm)
Gift of Leonard Rowe, 1958.481

BOFU (DRUM)
China
wood, paint, animal hide, brass
Gift of William H. Doane, 1919.165

*JINGHU AND BOW (JING-HU) (TWO-STRINGED
FIDDLE)*
Unknown (Chinese), Golden Tone Workshop
China
bamboo, snakeskin, black cloth, teak, bone,
possibly boxwood, bamboo, horse hair, adhesive
backed cloth
Gift of Lawrence Lock (Yan-Chun), 1950.27

OBJECTIVES

- Students will learn about traditional Chinese instruments from the collection of the Cincinnati Art Museum.
- Students will collect data about these instruments as they learn about the terms vibration, pitch, frequency and amplitude.
- Students will classify the instruments as aerophones, chordophones, membranophones or idiophones, based on the way they produce sound.
- Students will use what they have learned about instrument design and sound to construct their own musical instruments from recycled materials.
- (Optional) As a group, students can perform an original song for the class with their instruments.

CONCEPT

Chinese instruments can be classified by their materials and methods of sound production. In this lesson, students will learn about traditional Chinese instruments in the Cincinnati Art Museum collection and classify them as aerophones, chordophones, idiophones, membranophones. Students will also learn about the terms

pitch, frequency and amplitude as they relate to music. Using what they learned about sound, students will work in small groups to create homemade instruments from recycled materials. (Optional) As a group, students can perform an original song for the class with their instruments.

MATERIALS

Recycled Containers
Wide Clear Tape
Hot Glue
Fabric
Rubber bands
Twine or yarn
Acrylic Paint
White Glue

Paint Brushes
Beads
Feathers
Buttons
Scissors
Exacto Knives
Tin Snips
Hole Punchers

VOCABULARY

Vibration
Pitch
Frequency
Amplitude

Aerophones
Chordophones
Membranophones
Idiophones

PROCEDURE

1. The teacher will begin the lesson by asking questions about instruments:
 - *Does anyone play an instrument or have a brother or sister who plays one?*
 - *What kind of sound does it make?*
 - *Does it make a high or low sound? Pitch is the word we use when we talk about high or low sounds- a bird chirp has a high pitch , a lion's roar has a low pitch*
 - *Is the pitch of your instrument high or low?*
 - *Can you change the pitch of your instrument? How?*
2. If possible, the teacher or a young musician from class will demonstrate how pitch can change on an instrument. As you demonstrate, explain to students what is happening. Say: Sound is produced by vibrating objects. On a wind instrument, like a recorder, flute or trumpet, vibrating air particles move in a tube to create sound. As holes are closed in the tube when it is played, the air column becomes longer, producing lower pitches. Sound waves with a low pitch have a low frequency (the number of vibrations per second or Hertz). On a string instrument, a musician causes sound by strumming the strings. When a string is shortened, it makes a higher sound or pitch. Strings that are longer or thicker make lower sounds.
3. SAY: Now, let's learn about some Chinese instruments from the Collection of the Cincinnati Art Museum. These instruments can be classified in two ways- by the way they make sound and by their materials.
 - An **aerophone** makes sounds by pushing air through the cylinder (a flute, clarinet, or trumpet and Chinese instruments Dizi, Xiao, Guan, Xun, Souna, Sheng)
 - A **chordophone** makes sound when a stretched string vibrates. The musician plays the instrument by strumming (guitar), rubbing with a bow or plucking (violin). Other chordophones include harps, pianos and banjos. Among Chinese instruments, plucked-stringed instruments include the Pipa, Liuqin, Yangqin, Ruan, Yueqin, Guzheng, Guqin, and Sanxian. Bowed-strings include the Erhu, Jinghu, Gaohu, Gehu, Banhu, and Matouqin.
 - An **idiophone** is an instrument that makes a sound when struck or shaken, based on its unique materials- glass, wood, metal, and stone etc. Chimes, gongs, bells, rattles and wooden blocks are

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idiophones. Chinese instruments include Bo- Bronze Symbols, Bianzhong- Collected Bronze Bells, Muyu- Woodblock Drum, Luo- Gong, and Yunluo- Set of Small Bronze Gong.

- Finally, a **membranophone** makes sound when a stretched membrane or skin is hit. Membranophones include tambourines, snare drums, and bongos and the Chinese instruments Bangu-Single-headed Frame Drum, and Tanggu- Medium-sized Barrel Drum.

4. Distribute Data Collection Worksheets and pencils to students.
5. Show an image of the first Chinese Instrument #1 – **DIZI** (Di- Transverse Bamboo Flute) Late 19th Century, China; bamboo, bone or ivory.
 - a. Students will listen to your description of the instrument and record data about its materials in the first column.
 - b. Ask students how they think the instrument is played and write it in column two (Air is blown into the mouthpiece)
 - c. Have them fill in column three- aerophones are instruments which make sound using vibrating air.
 - d. Play a clip of the sound for a DIZI (<http://chinesemusic.co.uk/traditional-chinese-instruments/blowed-woodwind-instruments>) and have students write what they think it sounds like in column four.
 - e. Have students fill in column five- High pitch and High frequency
 - f. Is the sound loud or soft? Enter your answer under amplitude- column six.
 - g. How do you think the musician changes pitch? Covering holes lengthens the column of air and lowers the pitch.
6. Show an image of Chinese Instrument #2 – **YUEQIN (MOON LUTE)**, China; wutong wood, other woods, soft stone, ivory or bone, possibly boxwood, metal.
 - a. Students will listen to your description of the instrument and record data about its materials in the first column. (or ask for a volunteer to read about the instrument)
 - b. Ask students how they think the instrument is played. (The instrument is plucked generally with a plectrum or pick)
 - c. Have them fill in column three- chordophones make sound using vibrating strings.
 - d. Play a clip of the sound for a YUEQIN (MOON LUTE) <http://resources.edb.gov.hk/musiceb/english/Instrument/chinese/yueqin/soundbox/sound.htm> and have students write what they think it sounds like in column four.
 - e. Have students fill in column five- High pitch and High frequency
 - f. Is the sound loud or soft- Enter your answer under amplitude- column six.
 - g. How do you think the musician changes pitch? The musician plucks the string and presses the frets to shorten the string and raise the pitch
7. Show an image of Chinese Instrument #3 – **HANGING BOSSED GONG**, China; copper alloy, wood, paint stand.
 - a. Students will listen to your description of the instrument and record data about its materials in the first column. (or ask for a volunteer to read about the instrument)
 - b. Ask students how they think the instrument is played. (The copper plate produces sound when struck with a padded hammer.)
 - c. Have them fill in column three-. Idiophones are instruments that are made from materials that have their own unique sounds—metal and then it is hit with a padded hammer or mallet
 - d. Play a clip of the sound for a HANGING BOSSED GONG and have students write what they think it sounds like in column four <http://chinesemusic.co.uk/traditional-chinese-instruments/percussion-instruments>
 - e. Have students fill in column five- Low pitch and Low frequency
 - f. Is the sound loud or soft? Enter your answer under amplitude- column six.
 - g. How do you think the musician changes pitch? The musician could hold the gong or change the velocity of the hammer hit

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8. Show an image of Chinese Instrument #4 – **BOFU (DRUM)**, China; wood, paint, animal hide, brass
 - a. Students will listen to your description of the instrument and record data about its materials in the first column. (or ask for a volunteer to read about the instrument)
 - b. Ask students how they think the instrument is played. (The animal skin produces sound when struck with a padded hammer or hand)
 - c. Have them fill in column three- membranophones are struck with a mallet or hand to cause the drum head to vibrate.
 - d. Play a clip of the sound for a BOFU (DRUM) <http://chinesemusic.co.uk/traditional-chinese-instruments/percussion-instruments> and have students write what they think it sounds like in column four.
 - e. Have students fill in column five- Low pitch and Low frequency
 - f. Is the sound loud or soft? Enter your answer under amplitude- column six.
 - g. How do you think the musician changes pitch? The musician could hold the drumhead or change the velocity of the hammer hit

9. Show an image of Chinese Instrument #5 – **JINGHU AND BOW (JING-HU)** (Two-stringed fiddle), Unknown (Chinese), Golden Tone Workshop, China; bamboo, snakeskin, black cloth, teak, bone, possibly boxwood, bamboo, horse hair, adhesive backed cloth.
 - a. Students will listen to your description of the instrument and record data about its materials in the first column. (or ask for a volunteer to read about the instrument)
 - b. Ask students how they think the instrument is played. The string instrument uses a bow made of horse hair to vibrate the strings.
 - c. Have them fill in column three- A chordophone makes sound when a stretched string vibrates
 - d. Play a clip of the sound for a JINGHU <http://chinesemusic.co.uk/traditional-chinese-instruments/bowed-stringed-instruments> and have students write what they think it sounds like in column four. Jinghug usually have a soft, elegant tone, and produce a feeling of weeping.
 - e. Have students fill in column five- High pitch and High frequency
 - f. Is the sound loud or soft? Enter your answer under amplitude- column six.
 - g. How do you think the musician changes pitch? The musician could put pressure on the bow to alter the pitch.

10. Students will now create their own instrument incorporating information about sound and pitch learned from the worksheet. They will make an aerophone, chordophone, idiophone or membranophone which can produce at least three pitches.

A large variety of recycled materials will be available for students to use, including paper towel tubes, 2 liter bottles, popsicle sticks, tin pans, cereal boxes, plastic jugs, yogurt containers, oatmeal boxes, rubber bands, buttons, beans, bottle caps, pipe cleaners, wrapping paper, fabric, tissue paper, tubing, white glue, tin foil, acrylic paint, stickers, wide masking, duck or clear tape, hole punchers, scissors, Exacto knives, hot glue guns, tin snips (to be used by intermediate students with supervision).

11. When the instruments are complete, have students complete the Data Collection Paper for Instrument #6- The student's own "Recycled Object" Instrument
 - a. Students will record the materials they used to create their own instrument.
 - b. Students will explain how their instrument is played.
 - c. Have them classify their instrument based on how it is played.
 - d. Write what they think it sounds like in column four.
 - e. Have students state if the instrument has a high or low pitch and frequency.
 - f. Is the sound loud or soft? Enter your answer under amplitude- column six.
 - g. As the musician, how can you change pitch?

12. (Optional) With a small group, students can use their instruments to perform an original song for the class.

ASSESSMENT

Students will participate in the class discussions about Chinese instruments and sound waves. Intermediate students will complete the Data Collection Sheet to organize information about sound and instruments. All students will use craftsmanship to build their own recycled instrument, and then perform a song for the class with a small group. Students can also complete an artist's evaluation about their instrument and group performance.

NATIONAL STANDARDS**Visual Art**

Standard 1: Understands and applies media, techniques, and processes related to the visual arts.

Standard 4: Understands the visual arts in relation to history and cultures

Standard 5: Understands the characteristics and merits of one's own artwork and the artwork of others

Music

Standard 8: Understanding relationships between music, the other arts, and disciplines outside the arts

Science

Standard 8: Understands the structure and properties of matter

Standard 9: Understands the sources and properties of energy

CURRICULUM CONNECTIONS**MUSIC**

Students can listen and watch Chinese artists play traditional instruments such as the Gu Zheng, Dizi, Erhu, and Pipa at <http://www.umslobby.org/index.php/2012/02/listening-guide-traditional-chinese-instruments-chamber-ensemble-of-the-shanghai-chinese-orchestra-7969>.

TECHNOLOGY

Use the Internet to research the instruments of other nations, such as Indonesia, West Africa, British Columbia or Bulgaria. Can you classify these instruments based on how they make sound?

SCIENCE

Students of all ages can learn about music acoustics and activities at Sound for Kids-PBS

http://pbskids.org/designsquad/games/string_thing/msg_how_sound_works.swf, Math, Science and Sound

Activities by Phil Tulga <http://www.philtulga.com/MSSActivities.html> or Music Acoustics by Yale University

<http://www.phys.unsw.edu.au/music/>.

RESOURCES

About Chinese Music

http://library.thinkquest.org/20443/traditional_music.html

Chinese Instruments- Performances

<http://www.umslobby.org/index.php/2012/02/listening-guide-traditional-chinese-instruments-chamber-ensemble-of-the-shanghai-chinese-orchestra-7969>

Chinese Instruments-USC

<http://www.uscycs.org/lang-en/instruments.html>

Chinese People Promotions- Chinese Instruments

<http://chinesemusic.co.uk/traditional-chinese-instruments>

CLASS EXPERIENCE

Classifying Musical Instruments

<http://cnx.org/content/m11896/latest/>

How Musical Instruments Make Sound

<http://library.thinkquest.org/11315/instrum.htm>

Making Instruments from Recycled Materials

<http://makingmulticulturalmusic.wordpress.com/tag/recycled-musical-instruments/>

Math, Science and Sound Activities-Phil Tulga

<http://www.philtulga.com/MSSActivities.html>

Music Activities

<http://cnx.org/content/m11063/latest/>

Music Acoustics -Yale

<http://www.phys.unsw.edu.au/music/>

The Musical Instruments E-book

<http://resources.edb.gov.hk/musiceb/english/Instrument/chinese/index.htm>

Sound for Kids

http://www.sciencekidsathome.com/science_topics/what_is_sound.html

Sound for Kids-PBS

http://pbskids.org/designsquad/games/string_thing/msg_how_sound_works.swf

String instruments from China

<http://www.philmultic.com/home/instruments/index.html>

Talking about Sound and Music-Worksheets

<http://cnx.org/content/m12373/latest/>