Percussion Instruments and Pitch

What factors affect the pitch of percussion instruments?

Grades 3-5 Lesson: Percussion Instruments and Pitch
Grade Band: 3-5
Arts Subject: Music
Other Subject: Science

SUMMARY

In this 3-5 lesson, students will identify instruments from the percussion family and create a percussion instrument. Students will use the scientific process to make predictions and explore how pitch changes based on the air space in a percussion instrument.

PREPARATION

Learning Objectives

Students will:

- Design investigations that determine what factors affect the pitch of percussion instruments.
- Explore the factors that determine pitch fluctuation of percussion instruments.
- Make, test, and record a hypothesis.
- Collect and analyze data from an investigation.

Standards Alignment

National Core Arts Standards

MU:Cn11.0.3a Demonstrate understanding of relationships between music and the other arts, other disciplines, varied contexts, and daily life.
MU:Cn11.0.4a Demonstrate understanding of relationships between music and the other arts, other disciplines, varied contexts, and daily life.
MU:Cn11.0.5a Demonstrate understanding of relationships between music and the other arts, other disciplines, varied contexts, and daily life.

Common Core State Standards

ELA-LITERACY.RI.3.7 Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur).
ELA-LITERACY.RI.4.7 Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.
ELA-LITERACY.RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.
ELA-LITERACY.W.3.8 Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.

ELA-LITERACY.W.4.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.
ELA-LITERACY.W.5.8 Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources.

Next Generation Science Standards
4-PS4-1. Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move.

Recommended Student Materials
Editable Documents: *Before sharing these resources with students, you must first save them to your Google account by opening them, and selecting "Make a copy" from the File menu. Check out Sharing Tips or Instructional Benefits when implementing Google Docs and Google Slides with students.*

- Slide: Percussion Instruments
- Instrument Family Characteristics
- Capture Sheet: Percussion Instruments
- Scientific Process: Percussion Instrument Pitch
- Acoustical Science Vocabulary
- Making a Percussion Instrument
- Rubric: Percussion Instruments

Videos

- Tambuco Percussion Ensemble of Mexico
- So Percussion: DIRECT CURRENT
- Couch Concert - NSO Musicians Scott Christian and Ricardo Cyncynates with Claire Eichhorn

Websites

- Perfect Pitch
- The Kennedy Center Instrument Spotter's Guide
- The Kennedy Center Guide to the Orchestra

Additional Materials

- Water Xylophone - 4 glass bottles or glasses about the same size, water, spoon, food coloring
- Coffee Can Drum - coffee can, construction paper, scissors, tape/glue, crayons, markers, or colored pencils
- Paper Plate Tambourine - two paper plates, shaking materials (popcorn kernels, dried beans, rice), crayons, markers, or colored pencils, stapler, tape

Teacher Background
Teachers should have a general understanding of acoustics, the physics of sound, percussion instruments, and sounds from the orchestra. Review The Kennedy Center Guide to the Orchestra to build background.

Student Prerequisites
Students should have a basic understanding of sound as waves and as energy, some familiarity with orchestral instruments, and prior experience with science experiments.

Accessibility Notes
Utilize assistive technologies for students with hearing or vision impairments. Modify capture sheets as needed and allow extra time for task completion.

INSTRUCTION
Engage
1. Review the members of the percussion instrument family with the Slide: Percussion Instruments. Share and review the bass drum, cymbals, maracas, piano, snare drum, tambourine, timpani, triangle, and xylophone using the Perfect Pitch interactive tool or the Instrument Family Characteristics table.

2. Play instrument listening clips for the percussion family from Perfect Pitch. Have students discuss what they hear and compare the sounds of the percussion instruments to those of other instruments.

Build
1. As a whole group, show students the Instrument Spotters Guide. Model for students how to scroll to each instrument family: strings, woodwinds, brass, and percussion. Start with the violin in the string family. As you read the "LOOK FOR" description, point out the parts of the percussion instrument.

2. Now guide students to the "LISTEN FOR" description. Tell students this note describes the sound of the instrument within its orchestral family. Guide students to the left of the photograph to show them how to click the "play" button to listen to the percussion instrument.

3. Model a few more instruments for students, then share the Instrument Spotters Guide so they can explore on their own devices. Distribute the Capture Sheet: Percussion Instruments so students can capture details about the instrument's characteristics.

4. Engage students in a discussion. Have students share and compare the information they gathered from the Capture Sheet: Percussion Instruments. *Ask the students: What can we conclude about each instrument's similarities and differences?*

Apply

1. Review the Acoustical Science Vocabulary. Discuss the meaning of the instrument-specific words air column and percussion with students.

> **Air Column**: space within the percussion instrument that determines the pitch.
>
> **Percussion**: sounds produced by striking the instrument with a mallet or stick, or striking one instrument against another.

2. Introduce the Scientific Process: Percussion Instrument Pitch activity. Review the process of forming a hypothesis and making a prediction. Tell students they will be making water xylophones and will need to figure out how to create different pitches.

3. Have students individually create a hypothesis relating the length of the air column to the pitch the instrument will create when played. The size of the air column is based on the amount of water in each glass bottle. Have students create a prediction based on this hypothesis using the sentence starter: "If our hypothesis is true, then the pitch created should be higher/lower when the air column is longer/shorter."

4. Divide students into cooperative groups of four. Assign one student to each of the following roles:

- Recorder: note taker
- Group Leader: keeps the group on task, moderates conflict, teacher liaison
- Equipment Adjuster: makes adjustments to test equipment
- Tester: performs the tests (mouthpieces should be sanitized before and after use)

5. Test the hypothesis within the groups. Students should fill four water bottles to different measured levels and record their observations on the Scientific Process: Percussion Instrument Pitch.

6. Review the procedural guidelines for Making a Percussion Instrument and distribute supplies. Allow time for students to create their percussion instruments. Play listening examples while students create their instruments from slide 12 of the presentation, Slide: Percussion Instruments.

7. Have students work in small groups to create a hypothesis and prediction regarding the relationship between air column length or size and the pitch it will create.

8. Have small groups test the second hypothesis and prediction using student-created instruments. Students should record their experimental data onto the Scientific Process: Percussion Instrument Pitch and complete the analysis and conclusion section.

Reflect

1. Discuss the following questions: *What is the relationship between pitch and the size of the air column?* (A longer air column creates a lower pitch. Since a breath travels a shorter distance in a shorter air column, the molecules move faster, creating a higher frequency and thus a higher pitch.) *What is the relationship between acoustics and science? What elements of the listening example influenced the design you created on your windpipe?*

2. Assess students' knowledge of bass instrument pitch with the Rubric: Percussion Instruments.

Credits

Original Writer, Leslie A. Thomas
Adaptation, Rebecca Haden
Editor, JoDee Scissors