Pitch Switcher!

Sounds can be loud like a train going by or quiet like leaves rustling in a light breeze. But sounds can also be high like a tea pot whistle or low like a fog horn. The loudness or quietness of a sound is its volume. The highness or lowness of a sound is its pitch. In this activity, you'll make a stringed instrument and see what it takes to switch the pitch!

Materials:

- Ruler with holes
- Rubber band
- Scissors
- Paper cup
- Masking tape
- Thumb tack

Procedures:

1. Use the point of a thumb tack to poke a small hole in the center of the bottom of the cup.

2. Cut a rubber band and push one end through the hole from the outside of the cup.
3. Tie 2 or 3 knots in the rubber band so that it will not pull out of the hole when stretched.
4. Put the other end of the rubber band through a hole near the end of the ruler. Tie the rubber band so that it is securely attached to the ruler.

5. Pull the cup to the other end of the ruler so that the rubber band is stretched but not too tight. Use masking tape to tape the cup to the ruler as shown.

6. Hold the cup near your ear and use your thumb and index fingers to pinch the rubber band. Then have a partner pluck the rubber band. Move your hand a short distance up the rubber band toward the cup and pinch the rubber band again while having your partner pluck the rubber band again. Did the pitch of the sound change? Did it seem higher or lower?
7. Move your hand further toward the cup again, pinch, and have your partner pluck the rubber band again. How did the pitch change this time? Pinch the rubber band closer and further from the cup and have your partner pluck it each time to hear the switch in pitch!

Think about this ...

You can try another activity to see if you can change the pitch of a vibrating piece of wood or plastic:

1. Lay a ruler on a table so that about 2/3 of the ruler is off the table.
2. Have a partner use one hand to firmly hold the ruler down on the table while you give the other end a little hit with your index finger. Listen closely to the sound.

3. Have your partner pull the ruler back a little so that the part sticking off the table is a bit shorter. Make sure your partner is holding the ruler down and then flick it with your finger again and listen to the sound. Is the pitch higher or lower than before?

4. Repeat step 3 a few more times.
5. What did you notice about how the pitch was related to the length of the vibrating part of the ruler?

Where's the Chemistry?

The pitch of a sound made by a string depends on how fast the string vibrates. The number of vibrations in a period of time, like a second, is called the frequency of the vibration. The frequency at which a string vibrates depends on the material the string is made of, how tight the string is stretched, and the length of the string. As you move your fingers up the rubber band and pinch it between your fingers, you are shortening the length of rubber band that can vibrate. The shorter the length of rubber band that can vibrate, the higher the sound; the longer the length of rubber band that can vibrate, the lower the sound.

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The collection can be used to supplement the science curriculum, celebrate National Chemistry Week, develop Chemists Celebrate Earth Day events, invite children to give science a try at a large event, or to explore just for fun at home.

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Safety Tips

This activity is intended for elementary school children under the direct supervision of an adult. The American Chemical Society cannot be responsible for any accidents or injuries that may result from conducting the activities without proper supervision, from not specifically following directions, or from ignoring the cautions contained in the text.

Always:

- Work with an adult.
- Read and follow all directions for the activity.
- Read all warning labels on all materials being used.
- Wear eye protection.
- Follow safety warnings or precautions, such as wearing gloves or tying back long hair.
- Use all materials carefully, following the directions given.
- Be sure to clean up and dispose of materials properly when you are finished with an activity.
- Wash your hands well after every activity.

Never eat or drink while conducting an experiment, and be careful to keep all of the materials used away from your mouth, nose, and eyes!

Never experiment on your own!

For more detailed information on safety go to www.acs.org/education and click on "Safety Guidelines".

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