

SCIENCE



# The Science of Sound

Students will be surprised at the difference between sounds moving through the air and along strings and wires in this deceptively simple experiment.



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## Objectives

- To analyze and compare how sound changes as it travels through different media.
- To develop and use models to produce a variety of sounds.

## Materials (per pair of students)

- Wire hanger
- Strings made of different materials, at least 24 inches in length, such as:
  - yarn

- fishing line
- thread
- metal wire (such as guitar string or picture hanging wire)
- Optional: Objects made of different materials to use in place of the hanger such as wooden, plastic, metal rulers or spoons



## Lesson Plan

- 1 Have students work in pairs.
- 2 Tie the center of the string or wire to the neck of a hanger, leaving an equal length on both sides.
- 3 One student should hold one end of the string in each hand, forming a V with the hanger suspended in the middle. He or she should gently swing the hanger into the side of a desk and describe the sound that is produced.
- 4 The second student should do the same.
- 5 The first students should use their fingers to pass the vibration along the strings and into their ears. Have them wrap one end of the string around each index finger, and set the tips of their fingers gently into their ears. The hanger will dangle below. As before, the students should gently knock the hanger into a desk and note the difference in the sound.
- 6 The second students repeat the experiment and record the results.
- 7 Have students try again with different types of strings and make note of the sounds that are produced.
- 8 Allow students to construct an explanation for what they are hearing. As an extension, students can develop models using hanging objects of other materials. Have them predict how the sound will change each time.



### What's Going On?

Sounds are vibrations that travel in waves. When they reach our ears, eardrums vibrate and we hear sounds. Waves need mediums through which to travel so that energy can pass from one molecule to the next. Depending on how close the molecules are, and the tighter their bonds, the faster those vibrations move. In this experiment, the sound had to initially travel from the hanger to students' ears through the air, a gas. When the students held the string up to their ears, the sound traveled through the string, a solid. Because molecules are spread further apart in a gas than in a solid, the sound changed. Similarly, by changing the material of the string, or by replacing the metal hanger with a different object, a variety of sounds were produced.