Area/Skill - Science	Cognitive Skill Level - Analysis/Evaluation	Correlation to Framework - 03.01/03.04/03.07	Lesson Number - 31

Activity Title - Traveling at the Speed of Sound

Goal/Objective

To use the scientific method to predict the speed of sound.

Lesson Outline
Introduction

Begin the class discussion by talking about sound. What is sound? How does one measure sound? Discuss that sound is a wave and that the speed of any wave can be calculated by the equation:

speed = frequency x wave length

Activity

Inform students that through experimentation and the implementation of the scientific method, they will determine the speed of sound. Speed of sound is generally displayed as units of meters per second. The wavelength of a sound wave can be found by allowing the sound wave to pass near a tube. When the length of the tube is one-quarter of the wavelength, the sound wave will resonate. This means that the sound wave will get louder. By finding the length of the tube, students can then calculate the wavelength of the sound wave since the frequency of the tuning fork is known.

Have students repeat the experiment using different frequency tuning forks.

Debriefing/Evaluation Activity

Have students compare the results from using different frequency tuning forks. Did the speed remain constant or very similar? Have students discuss why or why not? They should get the same speed for different tuning forks.

Real-Life Connection

Use of the scientific method is important in daily life to predict possible outcomes. Have students brainstorm different facts that they use in their home, workplace, or community that were the result of someone at sometime using experimentation through the scientific method. Write the students' answers on the board. An example would be the determination of Fahrenheit and Celsius, the freezing or boiling points of water, etc.

Materials/Texts/Realia/Handouts

- Tuning forks
- Graduated cylinders
- Water
- Rulers with centimeter markings
- Computers with Internet access
- Paper and pencils
- Calculators
- Chart paper/board and markers

Extension Activity

Have students search the Internet to see if they can find the speed of sound. Some links will use equations for the speed of sound at various temperatures. Have students compare the results of the experiment (generally around 345 m/s) to the research from the Internet. Were the

ESE/ESOL Accommodations

Provide students with written directions for the experiment.

Give students conversion charts so that they can convert to meters through the use of the chart.

Have students work in small groups where each student can take turns in completing the experiment or recording the answers.

Area/Skill - Science	Cognitive Skill Level - Analysis/Evaluation	Correlation to Framework - 03.01/03.04/03.07	Lesson Number - 31

Activity Title - Traveling at the Speed of Sound

Introduction

Ask: What is sound? Does sound travel? How fast does sound travel? How does one measure sound? *Say:* Sound is a wave. The speed of any wave can be calculated by a simple equation: speed = frequency x wave length. (Write the equation on the board.)

Main Activity

Say: Today, you are going to be scientists. Through experimentation and implementation of the scientific method, you will determine the speed of sound. The wavelength of a sound wave can be found by allowing the sound wave to pass near a tube. When the length of the tube is one-quarter of the wavelength, the sound wave will resonate. This means that the sound wave will get louder' you will actually hear it. By finding the length of the tube, you can then calculate the wavelength of the sound wave. The speed of sound is generally written as units of meters per second, such as 200 m/s. Let's look at the steps that you will take to conduct your experiment. (Review the following steps. You may wish to make a transparency or write the steps on the board.)

Say: All we need are tuning forks, graduated cylinders, water, and rulers with centimeter markings. Get in small groups and begin your experiment.
Experimental Procedure:

1. Put some water into a 100 ml or 500 ml graduated cylinder.
2. Tap a tuning fork on a soft object and place the fork near the opening of the graduated cylinder.
3. If the sound resonates (gets louder), proceed to step 5.
4. If the sound does not resonate, either add or remove water and then return to step 2.
5. Measure the distance in centimeters from the top of the water level to the top of the graduated cylinder. Record the distance.
6. Convert the distance from step 5 to meters.
7. Multiply the distance recorded in step 6 by the number 4. This will give you the wavelength of the sound wave.
8. No look at the tuning fork that you used. There is a number printed on the tuning fork which gives you the frequency of the sound wave.
9. Using the formula: speed = frequency x wave length, calculate the speed of the sound wave. Report your answer in units of meters/second.
10. Repeat the experiment using the different frequency tuning forks. You should get the same speed for each of the different tuning forks.

Closure/Conclusion

Ask: Did you get the same results from using different frequency tuning forks? Did the speed remain constant or very similar? Why or why not?

Say: You should have gotten the same number because the speed of sound is a constant number. What is the number? Let's find out.

Follow-Up Lessons/Activities

Say: Let's see if we can find the speed of sound through a search on the Internet. You will notice that some of the links that you visit may use equations for the speed of sound at various temperatures.