**Voice Science**

Inspired by *The Physics Teache*r’s:

“[Classroom Materials from the Acoustical Society of America](http://aapt.scitation.org/doi/full/10.1119/1.4818371)”

by W. K. Adams, A. Clark, and K. Schneider

**Description**: Students will sketch sound waves produced by their voices by singing into a sound analyzer.

**Purpose:** Students will sketch representations of high/low frequency (pitch) and high/low amplitude (volume).

**NGSS Connections:**

Disciplinary Core Ideas:

* 4-PS4-1 Waves and Their Applications in Technologies for Information Transfer

Cross Cutting Concepts:

* Patterns
* Energy and Matter

Science and Engineering Practices:

* Developing and Using Models

Performance Expectations: Waves and Their Applications in Technologies for Information Transfer

* **1-PS4-1-**Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move.

**Materials:**

* Wave visualizer app (smartphone/tablet with app such as *Physics Toolbox Sensor Suite*) on “Oscilloscope” mode.
* Tuning forks (optional)

**Modifications:**

* Given the complex nature of sounds produced by some voices, be prepared to use tuning forks to show a clear difference between high and low pitch sounds.

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**Student Worksheet**

**Note to teacher:** *Italicized commentary* are notes for teachers. Red statements show sample correct student responses. Highlighted yellow items are areas where students are likely to get “stumped.

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**Guiding Questions:**

1. What does the sound produced by your voice look like? Sing a constant note into the wave visualizer, and draw the shape below. Then, have your friend sing the *same* note, and draw the shape below.

Your voice

Your friend’s voice

1. What is similar and different about the sound waves produced by both of your voices?

*Students might notice that their voices don’t make simple waves. In fact, they are a combination of many tones. This produces a “timbre,” a quality of their voice that is unique to them!*

1. Using your own voice, compare how differences in **pitch** make different waves. To do this, sing a HIGH pitch note and a LOW pitch note, but try to keep the volume the same.

HIGH pitch sound

LOW pitch sound

1. Explain how these sound waves look different.
2. Using your own voice, compare how differences in **volume** made different waves. To do this, sing a LOUD sound and a QUIET sound, but try to keep the pitch the same.

LOUD sound

QUIET sound

1. Explain how these sound waves look different.