

A Respiration Study with Voyager and Scratch Programming

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Introduction

This lesson is motivated by a respiration study using a FLIR ONE™ thermal camera in conjunction with the Vernier Thermal Analysis Plus app. Using Voyager and the PocketLab Temperature Probe, however, allows students to investigate respiration at a fraction of the cost of a thermal camera. The response time for the Temperature Probe is rapid enough to observe temperature differences in the air inhaled and exhaled through the mouth during the process of respiration. In addition, by using the PocketLab-Scratch Beta Integration platform, students can be encouraged to design a Scratch program that shows a lung in the form of a sprite growing larger while inhaling and smaller while exhaling.

Performing the Experiment

The author found it best to breathe through the mouth while holding the thermister end of the Temperature Probe just outside of the mouth. As shown in Figure 1, the respiration rate can be determined from data collected by the csv file that is created by the PocketLab app. The step-like nature of the graph is an indication of the 0.2°C resolution of the Temperature Probe.

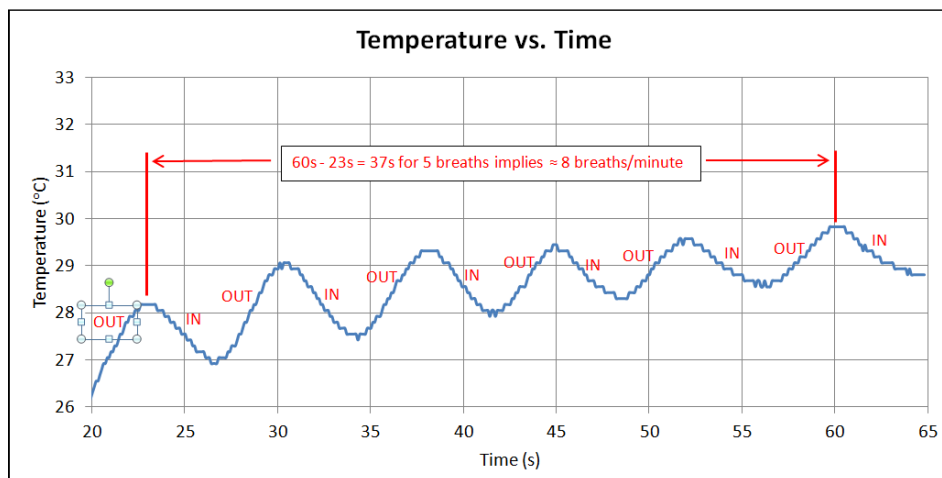


Figure 1

Figure 2 shows the Scratch program developed by the author. This program animates the lung sprite while the experimenter is breathing. A video from the *File/Record Project Video* option of Scratch is included with this lesson. It shows the lung expanding/contracting as the experimenter breathes in/out.

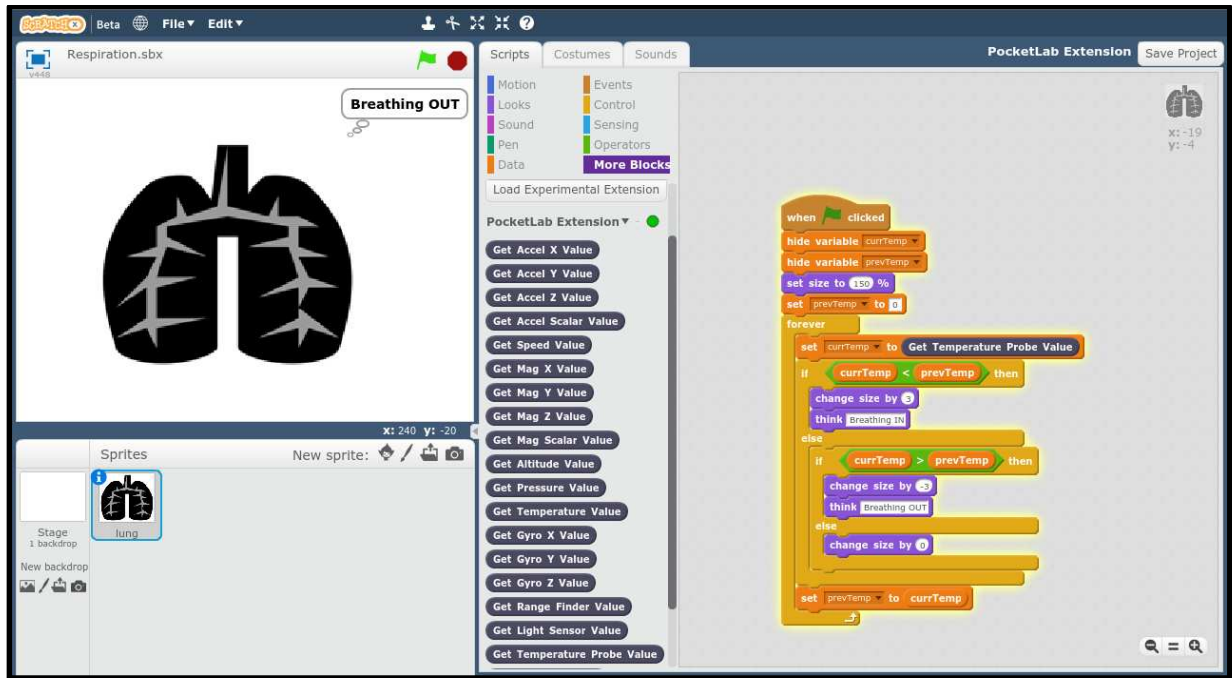


Figure 2