



Yale-New Haven  
Teachers Institute®

Curriculum Units by Fellows of the Yale-New Haven Teachers Institute  
2010 Volume IV: Renewable Energy

---

## **The Mathematics of Convection: Nature's Model for Energy Production**

Guide for Curriculum Unit 10.04.02  
by Timothy J. Chiaverini

This unit is developed for students learning algebra 1 or geometry concepts and covers approximately two weeks of instruction. During this unit, students will discover the answers to basic, yet scientifically critical questions such as: Why does warm air rise? Why does a two-ton boat float while a one-ounce rock sinks? What are the properties of water in liquid, gas or solid form? How does a hot air balloon fly? The unit will advance students' understanding of convection and its potential uses in renewable energy models. Convection currents can be powered by solar energy. One model that uses solar energy to create convection currents is the solar chimney, which is discussed in detail in the unit.

The unit takes an experimental, real-world approach and develops mathematical models. The unit makes valuable connections between science and mathematics. Students learn about buoyancy, density, temperature and volume, and explore real-world relationships between temperature and volume. Students make predictions and draw conclusions about scientific experiments using symbolic, linear, graphical and quadratic mathematical models. Through this process, they discover critical scientific concepts and use mathematics to make conjectures and develop evidence to support their conclusions.

(Developed for Algebra I and Geometry, grades 9-10; recommended for Pre-Algebra, Algebra I, and Geometry, grades 7-10)

---

<https://teachersinstitute.yale.edu>

©2021 by the Yale-New Haven Teachers Institute, Yale University  
For terms of use visit <https://teachersinstitute.yale.edu/terms>