GENERATIONGENIUS
ALWAYS QUESTION. ALWAYS WONDER.

TEACHER GUIDE

AIR MASSES AND WEATHER FRONTS

GRADES 6-8

COMMON MISCONCEPTIONS

- **Cold temperatures produce windy conditions.**
  Students have likely experienced gusty weather conditions on cold days. Winds are caused by the uneven heating of air and are just as likely to happen on warm days as cold days.

- **Hot air weighs less than cold air.**
  Hot air and cold air have the same mass. The reason hot air rises above cold air is because of density. The molecules of warmer air are more spread out. This results in less density which causes warmer air to rise above colder air.

- **Weather fronts are thin bands of air.**
  From looking at weather maps, students may think weather fronts are thin bands of air since weather maps indicate fronts using a thin line. In reality, some weather fronts are usually large air masses, some hundreds of miles wide. The weather front image on the weather map only indicate the boundary between air masses.

THE FORMATION OF AIR MASSES

Air masses are large bodies of air with generally the same temperature and humidity. These air masses can be very large, sometimes up to thousands of square miles. The temperature and humidity of air masses is determined by where they form. Air masses that form over polar regions are cold, while air masses forming closer to the equator are warm. Moisture content of air masses is also related to where they are formed. Air masses formed over bodies of water, such as oceans, have high water vapor content and tend to be humid. Air masses that form over continental regions tend to be dryer.

THE BOUNDARIES OF AIR MASSES CAUSE WEATHER FRONTS

There are 4 basic types of weather fronts: cold fronts, warm fronts, stationary fronts and occluded fronts. Cold fronts and occluded fronts tend to move more quickly and bring rainy and stormy weather. Mountains and other landforms can impact the movement of weather fronts, and sometimes slow them down. As warm fronts approach, there may be unstable air that produces thunderstorm or rain. A stationary front occurs when two air masses meet, but neither one pushes the other out of the way. Weather of a stationary front is typically cloudy and rainy. Eventually another air mass will come in and break up a stationary front.

TEACHER TIPS

Using water to demonstrate the interactions between hot and cold molecules is a good way for students to get concrete experiences with how air molecules behave. This simulation lets students see the difference in molecule movement in different temperatures.

ABOUT THIS LESSON

This lesson was created by the National Science Teaching Association (NSTA) to pair with the Generation Genius video and support *NGSS*.

They have requested we provide the following background with this lesson:

The Next Generation Science Standards (NGSS) are the national standards on how students learn science, and they are based on contemporary research presented in *A Framework for K–12 Science Education (the Framework).* The shift in science teaching and learning required by the Framework is summarized in this infographic: A New Vision for Science Education.

At the start of each Generation Genius lesson, students are presented with a phenomenon, then they try to explain it. Students will notice they have gaps in their knowledge and ask questions, which motivates them to build ownership of science ideas they need in order to explain how or why the phenomenon occurred. The way students build ownership of science and engineering ideas is through active engagement in the science and engineering practices (SEPs). This process of sensemaking, or doing science to figure out how the world works, is one of the major shifts the *Framework* encourages.

To engage in the SEPs, students should be part of a learning community that allows them to share their ideas, evaluate competing ideas, give and receive critiques, and reach consensus. Students can start by sharing ideas with a partner, then with a small group, and finally, with the whole class. This strategy creates opportunities for all students to be heard, build confidence, and have something to contribute to whole-class discussions. Each Generation Genius lesson provides conversational supports to facilitate such productive student discussions to contribute to sensemaking.

Excited to continue your shift toward the new vision for science education? Check out the Generation Genius Teacher Guide page on the NSTA website for resources and strategies to engage every student in your classroom in **doing** science.

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