GENERATIONGENIUS
ALWAYS QUESTION. ALWAYS WONDER.

LESSON PLAN

AIR MASSES AND WEATHER FRONTS

GRADES 6-8

SUMMARY

Students will create a model of convection with water of different temperatures to understand how wind forms.

NEXT GENERATION SCIENCE STANDARDS CORRELATION

MS-ESS2-5. Collect data to provide evidence for how the motions and complex interactions of air masses result in changes in weather conditions.

Science & Engineering Practices	Connections to Classroom Activity
Planning and Carrying out Investigations **Developing and Using Models**	• Students investigate what happens when different temperatures of water are added to room temperature water. • Students create a model of convection using different temperatures of water.

Disciplinary Core Ideas	Connections to Classroom Activity
ESS2.C: The Roles of Water in Earth's Surface Processes The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, ocean temperatures and currents, are major.	• Students will investigate how temperature relates to density. They will also see how changes in temperature cause movement of molecules.

Cross Cutting Concepts	Connections to Classroom Activity
Cause and Effect	• Changes in temperature cause the movement of molecules.

DURATION

45 minutes

MATERIALS

Materials per group:

- 3 Clear Plastic Cups (taller thinner work best)
- 2 Smaller Plastic Cups to hold blue/red water
- 1 Square clear Tupperware Container
- Red and Blue Food Coloring
- 2 Pipettes
- Ziploc Snack Bag
- Water (hot, cold, and room temperature)

ENGAGE

Share this slide with weather images. Have students talk to a partner or small group about what they notice about the weather images. Some questions you could prompt with, “What do you notice?” “Have you ever seen these types of changes in the weather?” “What causes the weather to change?” How does cloudy weather come in and replace sunny weather? Or does sunny weather replace rainy weather? Make the transition to the exploration by telling students they will be doing some experiments with water to learn about how air masses get moved around in our atmosphere causing changes in the weather. Tell students their experiments will be with water because it is easier to see than air, but air molecules behave the same way as water molecules.

EXPLORE

(Throughout this activity encourage students to take observation notes and draw pictures and diagrams of what they observe.)

For part one of this activity students will observe what happens when they put a pipette of cold water (colored blue) into a cup of room temperature water. They will use a pipette to gently squirt cold blue water from a small cup into the bottom of a cup of room temperature water. (The blue water will stay on the bottom of the cup.) They will then repeat the above with hot water (colored red) and observe what happens. Ask students why the blue water stays on the bottom of the cup, but the red water floats toward the top. You could also ask students if air would behave the same way as water. Air behaves in a similar way because when molecules are cold, they squish together and become denser. As they warm up, they spread out more and become less dense. Ask students how this idea might relate to the movement of air and changes in weather.

For part 2 of this experiment, students will once again squirt a pipette of blue cold water into a plastic cup of room temperature water. This time they will gently place their cup into a clear plastic Tupperware container and then place a Ziploc bag (snack sized bag works best) full of hot water on one side of the cup. They will observe what happens. After 10-20 seconds some of the blue droplets on the side of the cup touching the warm bag will start to rise up the side of the cup. Students should continue to observe as some of the blue droplets should start to fall back down on the opposite side as they cool. This slow circular movement demonstrates convection currents and relates to air movement and explains how wind forms.

EXPLAIN

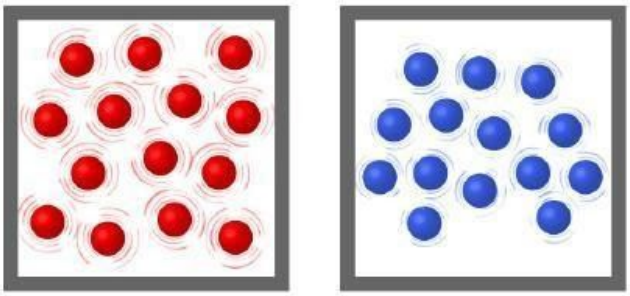
Allow students to share out what they observed. If they drew observation notes of what they saw invite them to share their drawings under the document camera.

WATCH THE GENERATION GENIUS AIR MASSES AND WEATHER FRONTS VIDEO AS A GROUP

After the video, help students make connections between their experiment and weather fronts. As they learned in the video, weather fronts occur when different air masses collide. Air masses are moved around by wind, which is ultimately created by the uneven heating and cooling of air. Some connecting questions you might ask, “What would happen if a cold air mass collided with a warm air mass? (Based on their experiment students should conclude that the colder air mass would sink below the warmer air mass since cold air is more dense than warm air.)

ELABORATE

Help students understand how molecules behave at different temperatures by using visual models. Share this image with students and ask what they notice. They should notice that there are the same number of molecules in each, but the hot water molecules are more spread out. This makes the hot water less dense than the cold water. Air molecules behave the same way as water molecules with regards to temperature and density.



Hot water (a)

Cold water (b)

EVALUATE

Students can play the online Kahoot! quiz game located below the video which provides downloadable scores at the end of the quiz game. Alternatively, you can use the paper quiz or the exit ticket questions. All these resources are located right below the video in the assessment section.

EXTENSION

The process of convection takes place within the atmosphere, the geosphere and the hydrosphere. Have students research how convection takes place within the Earth and in our oceans.