Utah State University
DigitalCommons@USU

Education and Outreach | Getaway Special (GAS)

10-1-2009

Sixth Grade Lesson Plan: Heat Moves

Getaway Special Team 2009

Recommended Citation
Getaway Special Team 2009. (2009, October). Sixth Grade Lesson Plan: Heat Moves.

This Other is brought to you for free and open access by the Getaway Special (GAS) at DigitalCommons@USU. It has been accepted for inclusion in Education and Outreach by an authorized administrator of DigitalCommons@USU. For more information, please contact becky.thoms@usu.edu.

Lesson Plan – 6th Grade

Unit Theme: Heat Transfer
Lesson Title: Heat Moves
Grade Level: 6th

Subject Area: Science
Number of Learners: Entire class
Time Needed: 30 minutes

Curriculum
Standard 6
Students will understand properties and behavior of heat, light, and sound.

> Objective 1 – Investigate the movement of heat between objects by conduction, convection, and radiation

Materials Needed

- Keyboard Air Duster can
- Electric resistive heater
- Hair dryer
- Ice
- Food coloring
- Water (cold and hot)
- Casserole dish
- Hand warmer
- Two Drinking bottles (20 oz. Gatorade bottles with wider mouth tops work best)
- Playing Card

Learning Objectives
Students will understand that heat moves by convection, conduction, or radiation. They will be able to connect these heat transfer methods to real life occurrences. Students will also understand that heat moves and that cold is just the lack of heat.

Background Knowledge
Heat is the transfer of thermal energy between two systems that are at different temperatures. The energy is always transferred from the warm object to the cooler one. The system will transfer heat until both objects are at the same temperature. There are three methods of heat transfer, conduction, convection, and radiation.

Conduction is when heat moves through direct contact. Molecules bump into each other and give some of their energy to other molecules. An example would be a spoon placed in a pot of boiling water. The flame never touches the spoon but the flame touches the pan which heats up the water molecules. Then the water molecules bump into the molecules of the spoon and heat them up causing the spoon to warm up.

Convection is the transfer of heat in air or through a fluid current. Heat is transferred to some molecules and then those molecules are moved away and replaced by new ones such as the rising and falling of warm and cold air. Convection only happens when you have things moving. One example is as a fan blows air on you, you feel cooler. Convection happens when hot air rises. The hot air goes up because it is less dense (the amount of mass per unit volume an object has) and the cold air comes down because it is more dense. The cooler air then becomes hot and rises and this creates a cycle of transferring molecules. This is also what happens in a hot air balloon or boiling water.

Radiation is the transfer of energy as electromagnetic waves. This does not require a medium like conduction and convection do. This is how the sun heats up the earth and why you get warm near a campfire. The heat moves by infrared waves in the electromagnetic spectrum.

Instructional Procedures

Ask the students what they know about heat. If they do not understand, explain heat. Teach students that heat flows from a high temperature to a low temperature.

<u>Conduction</u>

Ask the students what they think conduction is and give some examples. Explain to the students what conduction is from the previous definition. Relate conduction to a train conductor that has to be in contact with the train to keep it moving.

-Ask the students to place one hand on their desk and one hand on the metal leg of their chair. Ask them which hand which hand is colder. Explain to them that the hand on the chair is colder because heat is leaving their hand. This is a form on conduction.

-Students will then be given a keyboard air duster can to touch and feel how the can gets cold when the air is discharged. The students will see how heat leaves their hand to go to the now cold can. They will understand that if they didn't touch the can, no heat would leave their hand.

<u>Convection</u>

Ask the students what they think convection is and give some examples. Explain the methods of convection as previously described. Explain to the students that in space convection doesn't happen, and this is the purpose of the FUNBOE project research because of the lack of gravity.

-In a casserole dish filled with water, place a hand warmer on one side and ice on the other. Add food coloring on both ends and have the class watch. This will show how heat moves from the hot side to the cold side by convection.

-Place a bottle of cold blue water on top of a bottle of warm red water separated by a playing card. Ask the students what they think will happen. Remove the playing card and we see the warm water rises and the cold water falls as they mix together. This is another example of convection currents.

Radiation

Ask the students what they think radiation is and give some examples. Explain radiation to the students. Explain to them that we can feel the radiation, but we can't see it without out the use of special filters.

-Allow the students to feel the radiation in the form of heat coming off of an electric resistive heater. They will understand that the heat moves without any air moving and without any contact. Place a piece of paper between the heater and the student's hands to show that heat from radiation can't go through the piece of paper.

To solidify these ideas, melt a block of ice using different methods of heat transfer. Use a hand warmer to demonstrate conduction, a hair dryer to demonstrate convection and radiation, and the electric restive heater to demonstrate radiation.

Assessment

Simple examples of each type of heat transfer will be shown and students will be asked to answer which one happens.

Extensions

-Use one helium and one air filled balloon to help solidify the principle of density. Ask the students to think of objects with much or little density. This can be related back to the hot air rising which is less dense than the cold air falling which is more dense in convection currents.

-Have the students write down their experiences with heat transfer for a few days and then report back in class. Share findings as a class or in small groups.

-Teach about the sun's energy. Use a diagram to show the convection currents that heat the sun and give its surface energy. If the energy on the surface becomes too great, it causes a burst of energy, known as a solar flare. The solar flare is radiation energy that is emitted sporadically in bursts from the sun's surface.

-Talk about earthquakes and ask the students to research the source of energy for the massive movement of the earth. They will find that the energy comes from convection currents in the earth's magma.