The Heat is On

Summary

Heat is produced when objects are rubbed against one another. Students will compare relative differences in the amount of heat given off through simple investigations.

Time Frame

1 class periods of 45 minutes each

Group Size

Small Groups

Life Skills

Thinking & Reasoning, Communication

Materials

For each group:
Pencil or pen
Sandpaper
Thermometers
Block of wood
Lotion
Science journals or pencil and paper

Background for Teachers

Forces give energy to an object. When objects are rubbed against each other, the energy produces heat.
Many things in our lives rub against each other, creating heat. Brakes on a bike create heat as they apply force to stop the wheels. Sliding down a rope is not only painful, but causes burns as the rope rubs against the palms of one's hands. Most students have experienced burns from the rug or carpet if they have slid across the surface on their knees.
These simple investigations will illustrate this concept for students. Care should be taken that students do not use excessive force to create enough heat to cause injury to themselves or others.

Student Prior Knowledge

Students will find it helpful to understand what a force is.

Intended Learning Outcomes

Make simple predictions and inferences based upon observations.
Use instruments to measure temperature.
Conduct a simple investigation when given directions.
Pose questions about objects, events, and processes.
Report observations with sentences.

Instructional Procedures

Step 1. In the first part of this activity, have students rub their hands together quickly. Ask them to write down in their journals what occurred. (When I rubbed my hands together it got really hot!) Ask if

anyone can explain why this occurs? Write all suggestions on the chalkboard.
Step 2. Have students get into their groups and pass out materials. Tell them their task is to investigate and make observations about what occurs when objects are rubbed against each other.
Step 3. Have students take turns sanding a piece of wood for at least 30 seconds. When the time is up, have them record what happened.
Were they able to sand for the entire 30 seconds? Why or why not? If they could finish, did they feel the sandpaper? Was it warm? Hot?
What caused this to occur?
Did they use any forces to do this experiment? What kind? (Rubbing is a push/pull action)
Step 4. Have them try another simple investigation and make observations. Each group member takes either a pencil or a pen and quickly scribbles back and forth for approximately 30 seconds. At the end of the time, have them quickly touch the tip of the pencil or pen to their other hand and note the temperature.
Is is hot? (Yes!)
What two objects were rubbed against each other?
Was heat created?
Can they think of examples in their own lives where things rub together and create heat? (Skidding on their bike, sliding on the carpet, rubbing two sticks together, etc.)
Step 5: Have them rub their hands together again for 30 seconds. Put a thermometer between their hands immediately after rubbing their hands together and measure the temperature. Now put lotion on their hands and rub them together for 30 seconds. Again measure the temperature immediately. Was there a difference? Why? (The lotion acts as a lubricant, reducing the impact of the force.) Can they think of examples in their own lives where lubricants are used to reduce heat? (Oil in engines, Vaseline on places where skin rubs together, oil on door hinges, graphite in locks and on wheels of Pine Wood Derby cars)
Step 6. In their journals, have each student write a conclusion to their observations and answer the question, "What happens when two objects are rubbed against one another?" Answers should show students understand that the force of rubbing one thing against another transforms motion to heat energy. Students will also list two examples in their own lives where this occurs.

Assessment Plan

Collect science journals and check for understanding of this concept.
Have students play a game of charades called "The Heat is On." Each will take turns acting out an example of rubbing two objects together, and from their actions classmates have to decide what two objects are creating the heat. (This will require more than just pretending to rub back and forth. They will need to do something to give their audience clues as to what the objects are before the "rubbing" begins. For example,if they are pretending to use a pencil, write with it a little first.)

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