INVESTIGATING EVAPORATIVE COOLING

NGSSS:

1. ***SC.8.N.1.1*** Define a problem from the eighth grade curriculum using appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.
2. ***SC.8.N.1.2:*** Design and conduct a study using repeated trials and replication.
3. ***SC.8.N.1.3:*** Use phrases such as "results support" or "fail to support" in science, understanding that science does not offer conclusive 'proof' of a knowledge claim.
4. ***SC8.N.1.6:*** Understand that scientific investigations involve the collection of relevant empirical evidence, the use of logical reasoning, and the application of imagination in devising hypotheses, predictions, explanations and models to make sense of the collected evidence.
5. ***SC.7.P.7.1:*** Recognize that adding heat to or removing heat from a system may result in a temperature change and possibly a change of state.
6. ***SC.7.P.11.4:*** Observe and describe that heat flows in predictable ways, moving from warmer objects to cooler ones until they reach the same temperature.

COMMON CORE:

CCSS.ELA-Literacy.RST.6-8.3
Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
CCSS.ELA-Literacy.RST.6-8.4
Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.
CCSS.ELA-Literacy.RST.6-8.7
Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
CCSS.ELA-Literacy.RST.6-8.9
Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

OBJECTIVES:

Students investigate the transfer of heat and cooling rate of warm water while learning that energy is a property of many substances and is associated with heat, light, electricity, mechanical motion and the nature of a chemical. They also learn that heat moves in predictable ways, flowing from warmer objects to cooler objects until they both reach the same temperature.

SKILLS:

- Students gain experience conducting the following procedures:
- Setting up the equipment and work area to measure the change in water temperature as it cools
- Designing and making two different-shaped foul containers for water
- Testing the cooling rate for water in each of the containers
- Testing the cooling rate for water in still air and water that is fanned
- Using math skills to find the difference between changes in time and changes in temperature

MATERIALS:

- Eurosmart datalogger
- Temperature Sensors (2)
- Graduated Cylinder
- Warm tap water
- Small fan
- Petri dishes (2)
- Aluminum foil

DRIVING QUESTION: *How can you increase the cooling rate of a substance?*
LAB SUMMARY: Students will make construct two bowls out of the aluminum foil with two different diameters. Using the graduated cylinder, they will pour warm water into each bowl. They will take the initial temperature of the water and then take a sampling every two seconds for a specific amount of time. They will record the initial water temperatures from each bowl, the final temperatures for each bowl and the time it took for them to reach the same temperature. Students will also obtain two Petri dishes that are the same diameter and made of the same material. They will fill both Petri dishes with warm water. They will record the initial temperature of both Petri dishes and then place a small fan next to one of the Petri dishes so the fan can blow on the water. Students will continue recording data for a specific amount of time. They will record the temperatures at which they became constant. They will also record the time it took for them to each become constant. Students will analyze their results. Finally they will calculating the cooling rate of each container in each experiment.