

KEEP YOUR COOL

TRADE LINK: REFRIGERATION AND AIR CONDITIONING MECHANIC

RATIONALE

Heat is a form of energy very important to our lives and to our community. Students should have an opportunity to explore properties of heat through discovery. Students at this level learn about the kinetic molecular theory and the particle theory. They can explain heat loss or transfer using these theories.

METHOD

In this activity, students will be asked to design a device to minimize heat loss. Using classroom materials provided by the teacher, students will create a device to hold a container of ice cold water. Although the teacher provides generic materials for this activity, students should be encouraged to be creative and to identify other readily available materials for use in their designs. The students will take the temperature of the ice cold water at the beginning of the activity and after each half hour until the end of the day or until the water's temperature is at room temperature. The data can be displayed in a graph that charts time versus temperature.

CURRICULUM OUTCOMES

Students will use scientific inquiry and technological design skills to solve practical problems, communicate scientific ideas and results, and make informed decisions while working collaboratively. (Middle School Science)

MATERIALS

- Container of ice water (plastic bottle, cup with lid, graduated cylinder, etc.).
- Tape (duct tape or masking tape)
- Materials for container could include cardboard, rigid insulation, plastic wrap, and tinfoil.

GETTING STARTED

Heat is a form of energy that people living in cold climates are very familiar with. In this activity, you will explore heat loss. The goal is to design a container that allows a cold liquid to stay cold for the longest possible time.

TEACHER BACKGROUND

Duration: Two 45 minute classes (includes taking temperature readings during the day).
Group Size: Small groups of 4 students.
Setting: Indoors (classroom).

THE ACTIVITY

Day One:

1. In your group, brainstorm ideas on what your design might look like and what materials you would like to use.
2. Once you have a design in mind, make a sketch of it on a piece of paper and list all the materials you will be using on the same sheet of paper.
3. Before you build your prototype, have your teacher initial it to indicate that your design has been approved for construction.
4. Choose someone from your group to measure out 100ml of the ice cold liquid once you have built your prototype.
5. Place the container of ice cold liquid in your newly created design after you take a temperature reading of the ice water.
6. Take a temperature reading every half hour for the rest of the day or until you have to go home.

SKILLS FOR SUCCESS

Day Two:

1. Plot a graph of temperature versus time to show your data, using your group's temperature readings. (Numeracy)
2. Once everyone in the class has had a chance to record their data, determine which designs were the most effective. (Reading, Creativity & Innovation)
3. Organize data in a spreadsheet - use of computer application optional (Digital)

BRANCHING OUT (EXTENSIONS AND VARIATIONS)

1. Try using different materials or improving on your design by combining the best ideas generated in various students designs.
2. Create different containers to hold the ice water and repeat the experiment using your original device.

INFORMATION BITE

As a refrigeration and air conditioning mechanic apprentice, you would learn about the science related to changes of state, heat and temperature, properties of coolants, compression, heating systems, electricity, equipment controls, gas laws, and small engines. Training involves ordering, assembling, installing, calibrating and testing of industrial and commercial equipment. All levels of training and work require the use and knowledge of calculation math, estimation, and data analysis. You would work for companies that install and service air conditioning and refrigeration systems.

