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RESOURCE AREA FOR TEACHING

STEAM
SCIENCE TECHNOLOGY ENGINEERING ARTS MATHEMATICS

LEARNING ACTIVITY

Materials Needed

- At least two ice cubes
- 2 waterproof plates
- 2 Cups
- Straws, popsicle sticks, or similar items (for structure)
- String, tape, glue, or similar items for fastening
- Paper, cardboard, bubble wrap, rags, or foam blocks. These will be used for insulation
- Optional: any other item around the house, or yard, that you predict will slow ice from melting

Grade Range

3-5
6-8

Topics/Skills

Science: States of Matter; Observation
Engineering

Learning Standards

NGSS: Earth Systems
CCSS ELA: Narrative Writing

Duration

20-30 minutes

Prep Time

15 minutes

The Ice Preserver Challenge

How Long Can You Keep It Cool?

Snow and ice were used by early civilizations to preserve food and make frozen treats.

Activity Challenge

Design, draw and build an ice preserver to slow down the melting of an ice cube.

Preparation

1. Find a place that will not be damaged by melting ice or condensation.
2. Predict how long it might take to completely melt an uncovered ice cube at room temperature.
3. Imagine designs that could slow the melting of an ice cube. What materials, or types of materials, could be used to build your ice chest?
4. Draw a picture of how the materials from step 3 might be layered or positioned around an ice cube in order to slow the melting process.
5. Predict how much longer your design will add to the melting time.

To Do

1. Create a prototype ice preserver from your drawing from **Preparation** step 4.
2. Place an uncovered ice cube on a plate and a similarly sized ice cube in your ice preserver. Take note of the time or start a stopwatch.
3. Observe both ice cubes every ten minutes. Note the times when each ice cube is half of its original size, and then when each one is completely melted.
4. Compare your prediction from **Preparation** steps 2 and 5 to the actual times for each ice cube to melt completely.

Observations

- Record how much additional time the ice cube in the ice preserver took to melt halfway and then completely compared to the uncovered ice cube.
- Draw and build a tower or other structure that is made from ice cubes. Repeat the experiment again checking on the melting of each design.

- How much longer did it take for the ice cube in your ice preserver to melt compared to the uncovered ice cube?

Extensions

Creativity Challenge

- Think about ways to improve the design of your ice preserver. Could different materials be used or different amounts? Could the materials be positioned differently around the ice cube?
- Redesign the ice preserver to build an improved prototype. Test the new prototype.
- How could your ice preserver be decorated?
- Create an ad, slogan, and/or jingle for your new ice preserver.

Language Challenge

- Write a story about a lost item that was found in a melting glacier.

Math Challenge

- How much longer would it take to completely melt a cube shaped block of ice, formed from 4 ice cubes put together, compared to a single ice cube, at room temperature? Repeat for a cube shape made from 9 ice cubes.

Research Challenge

- How was ice, from frozen ponds or rivers, stored for use in warmer months? How was ice shipped in sailing ships?
- How could ice be naturally created in warmer climates away from the mountains?

The Science behind the Activity

When water is cold enough to freeze it can turn from a liquid into a firm, smooth, and translucent solid known as ice. When the temperature rises above 0° C (32 °F), ice can melt, changing back into water, which is the liquid form (or state).

Heat can be transferred in three different ways: radiation, conduction or convection. For example, the sun's rays shining on an ice cube would transfer heat using radiation. If an ice cube touches a surface heat would transfer by conduction. Blowing air onto an ice cube transfers heat using convection.

Insulating materials can shield the ice cube from the sun, moving air, and it could also prevent the rate at which a surface transfers heat. Using various designs and materials, items like ice, bodies, and homes, can maintain desired temperatures. What materials of insultation are best suited for reducing the rate of heat transferred by radiation, conduction, and/or convection? The thickness of a material will change the effectiveness of the insulation.