Ice Cube Race

Student Objectives
The student:
- will energy transfer in common terms
- will know several methods of energy transfers and several energy sources.

Key Words:
absorption
energy source
energy transfer

Materials (per group):
- small block of ice (100 ml water frozen in paper cup and then removed)
- plastic bag with zip seal
- graduated cylinder
- Science Journal

Time:
1 class period

Procedure
1. Divide class into groups of two students per group.
2. Explain procedure to class.
   - Each group will place a 100 ml ice cube in a plastic bag.
   - They will have 5 minutes to transfer as much energy as they can to their cube (to melt it). They may place the plastic bag anywhere they want, or do anything to it, as long as the bag remains sealed.
   - At the end of five minutes each group will measure the amount of water in their bag using a graduated cylinder.
3. Pass out materials and begin timing.
4. Help students as needed during the five minute interval.
5. After students measure their water, lead a discussion on which methods produced the most water emphasizing what type of energy transfer is occurring in each case and what was the energy source used. Concepts to reinforce: heat flows from a warmer object (such as their hands) to a cold object, changing its temperature; and that water undergoes a change of state when it reaches 0^{o} C (or 32^{o} F).
6. Students should complete their Science Journal.

Key Words and Definitions
- **absorption** – the process of light energy changing into heat energy when light falls on an object and is taken into it
- **energy source** – object or material that produces energy by changing it from one source

to another
- **energy transfer** – the transformation from one type of energy into another

Further Research

1. Have the students do a second trial using what they learned from the first trial. Graph the results of both trials to see the class improvement.
2. Discuss the energy transfers as far back as possible (to the Sun if possible).
3. Make ice cream and discuss the energy transfer involved.
4. Place pieces of screen on the tops of mason jars. Divide class into groups of "sun" and "shade". The sun groups place their jars in the sun and the shade groups place theirs in the shade. Put a 100 ml ice cube on the top of each jar. The groups measure the amount of water in the containers every three minutes and graph their results (return the water to the jar after each measurement). As a class average the interval amounts together for the sun trials and for the shade trials. Plot these averages on a two line graph.

Related Reading

- ***Energy: Heat, Light, and Fuel (Amazing Science)*** by Darlene Stille (Picture Window Books, 2004)
  This book introduces children to the ways that energy changes forms. The forms of energy are discovered, including chemical energy, kinetic energy and solar energy.
- ***The Snowball Rent: A Story from Scotland*** by Verna Wilkins, Gill McLean, and Barry Wilkinson (Tamarind Books, 1993)
  A young boy finds a way to bring a snowball down from the mountaintop to satisfy a cruel landlord and save his poor Scottish village. Includes discussion questions and activities that explore the scientific principles in the story.

Internet Sites

http://www.funkidslive.com/learn/curious-kate/curious-facts-insulation/
Fun Kids, Curious Facts about Insulation. Explanation of how we use insulation to keep our homes warm/cool. Also discusses how our use of insulation saves us money and helps save the planet by reducing our carbon footprint.

http://www.sciencekids.co.nz/gamesactivities/keepingwarm.html
Science Kids site. Interactive game for students that allows them to compare different materials and how well they insulate a beaker.

http://www.sciencenetlinks.com/interactives/powerplay.html
American Association for the Advancement of Science, Science Netlinks' Power Play site. Power Play is an interactive activity that helps users learn about harnessing energy from different power sources.

Ice Cube Race

Florida NGSS Standards & Related Subject Common Core

			.1	.2	.3	.4	.5	.6	.7	.8
Grade 3										
The Practice of Science	**Big Idea 1**	**SC.3.N.1**	**X**	**X**	**X**	**X**	**X**			
Changes in Matter	**Big Idea 9**	**SC.3.P.9**	**X**							
Forms of Energy	**Big Idea 10**	**SC.3.P.10**	**X**	**X**						
Grade 4										
The Practice of Science	**Big Idea 1**	**SC.4.N.1**	**X**	**X**			**X**	**X**		
Forms of Energy	**Big Idea 10**	**SC.4.P.10**	**X**	**X**						
Energy Transfer & Transformations	**Big Idea 11**	**SC.4.P.11**	**X**	**X**						
Grade 5										
The Practice of Science	**Big Idea 1**	**SC.5.N.1**	**X**							
Forms of Energy	**Big Idea 10**	**SC.5.P.10**	**X**	**X**						

Third Grade Benchmarks

Science–Big Idea 1: The Practice of Science

- SC.3.N.1.1 - Raise questions about the natural world, investigate them individually and in teams through free exploration and systematic investigations, and generate appropriate explanations based on those explorations.
- SC.3.N.1.2 - Compare the observations made by different groups using the same tools and seek reasons to explain the differences across groups.
- SC.3.N.1.3 - Keep records as appropriate, such as pictorial, written, or simple charts and graphs, of investigations conducted.
- SC.3.N.1.4 - Recognize the importance of communication among scientists.
- SC.3.N.1.5 - Recognize that scientists question, discuss, and check each others; evidence and explanations.

Science–Big Idea 9: Changes in Matter

- SC.3.P.9.1 - Describe the changes water undergoes when it changes state through heating and cooling by using familiar scientific terms such as melting, freezing, boiling, evaporation, and condensation.

Science–Big Idea 10: Forms of Energy

- SC.3.P.10.1 - Identify some basic forms of energy such as light, heat, sound, electrical, and mechanical.
- SC.3.P.10.2 - Recognize that energy has the ability to cause motion or create change.

Fourth Grade Benchmarks

Science–Big Idea 1: The Practice of Science

- SC.4.N.1.1 - Raise questions about the natural world, use appropriate reference materials that support understanding to obtain information (identifying the source), conduct both individual and team investigations through free exploration and systematic investigations, and generate appropriate explanations based on those explorations.
- SC.4.N.1.2 - Compare the observations made by different groups using multiple tools and seek reasons to explain the differences across groups.
- SC.4.N.1.5 - Compare the methods and results of investigations done by other classmates.
- SC.4.N.1.6 - Keep records that describe observations made, carefully distinguishing actual observations from ideas and inferences about the observations.

Science–Big Idea 10: Forms of Energy

- SC.4.P.10.1 - Observe and describe some basic forms of energy, including light, heat, sound, electrical, and the energy of motion.
- SC.4.P.10.2 - Investigate and describe that energy has the ability to cause motion or create change.

Science–Big Idea 11: Energy Transfer and Transformations

- SC.4.P.11.1 - Recognize that heat flows from a hot object to a cold object and that heat flow may cause materials to change temperatures.
- SC.4.P.11.2 - Identify common materials that conduct heat well or poorly.

Fifth Grade Benchmarks

Science–Big Idea 1: The Practice of Science

- SC.5.N.1.1 - Define a problem, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types such as: systematic observations, experiments requiring the identification of variables, collecting and organizing data, interpreting data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.

Science–Big Idea 10: Forms of Energy

- SC.5.P.10.1 - Investigate and describe some basic forms of energy, including light, heat, sound, electrical, chemical, and mechanical.
- SC.5.P.10.2 - Investigate and explain that energy has the ability to cause motion or create change.

National Next Generation Science Standards

Fourth Grade Standards

Science–Energy

- 4-PS3-3 - Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.

Ice Cube Race

1. How much water did you have at the end of 5 minutes? _____

2. What did you do to your plastic bag to help melt the ice? _____

_____

_____

_____

3. In your class, what method seemed to melt the ice the best? _____

_____

_____

4. If you could repeat the experiment, what would you like to try this time?

_____

_____

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