



Keeping Cool Naturally

Subject: Biomimicry

Grade Level: 5-8

Topic: Engineering Design Process

Time: 60 minutes

Learning Objectives

Students will:

- explore ways animals and insects stay cool in warm weather.
- use a biomimicry technique to build and test a house that can keep the occupants cool.

Materials

computer, *Keeping Cool Naturally Worksheet*, pint sized milk cartons (1 per group), recycled material, scissors, small digital thermometers, heat source (lamp or the sun)

Procedure

Engage: To promote student curiosity, have students imagine that it is the first day of school. A few hours have passed and the air conditioning stops working (if your school is lucky enough to have air-conditioning!)

Ask: What are some things you could do to help keep the students and teachers cool?

Explore: Help students build understanding by having students watch this video then talk about how plants work to keep themselves cool. [▶ NASA ScienceCasts: Sweating Can Be Cool](#)

Next, view this website with students.

[🌐 20 Incredible Ways Animals Keep Cool - The Air Conditioning Company](#) Have students discuss all the ways they learned about how animals stay cool. Discuss how these ideas could be used by humans to cool a space without air conditioning. *Ask: What advantages are there to using these methods in place of air conditioning?*

Explain: Have students begin to show what they have learned by dividing students into groups of 2 or 3. Provide each group with the *Keeping Cool Naturally Worksheet* that details how 3 different types of animals keep themselves cool. The 4 types are termites, prairie dogs, elephants, Cape Ground Squirrels. Have the group decide which method of the 4 could be most effectively used to design a house that can be kept cool (using only that method). Each group should provide a list of pros/cons for each method. Groups will share their ideas with the whole class.

Elaborate: Have students use their new knowledge to create a system using the ideas from one of the animal cooling methods they investigated, to create a system to cool a structure. Each group will be given a pint-sized milk carton to represent a home. Testing will involve building the cooling system, adding it to the model and then putting the model under a lamp or some heating source (can put them outside in the sun). Take and record a temperature reading before starting (before heating has started). Place a thermometer inside the structure and place structure under heating source. Students will record temperature data at 1 minute, 3 minutes and 5 minutes.

Assessment

Evaluate: Evaluate student learning by asking students to share their data to determine the effectiveness of their solutions. If students are old enough, plot data on a one graph for easy comparison. Discuss the pros/cons of each solution.

Extension Activities

- Do research about roof types, paint color, plants and other factors that could help to naturally cool a home.
- Have an area expert talk to students about the use of solar power for cooling and heating homes.

NGSS Alignment

Middle School Engineering Design

MS-ETS1-1 - Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment.

MS-ETS1-2 - Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

MS-ETS1-3 - Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each.



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