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## **Title: Do different colors absorb heat differently?**

**Subject:** Science

**Grade levels:** middle school

**Group Structures:** small groups

**Lesson Length:** 50 min

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**Summary:** Students test whether the color of a material affects how much heat it absorbs. They leave ice cubes placed on felt made of different colors in the sun, and predict which colored felt ice cubes melt first. They record the order and time required for the ice cubes to melt.

### **Learning Objectives:**

- Certain colors absorb light better than others
- The sun produces 2 types of energy: Thermal (heat) and Light (rays)
- The reason solar panels are the color they are

### **Materials:**

- 6 different colors of felt: Black, Red, Yellow, Orange, Green, White (You can cut these into small pieces all the same size)
- Ice cube (best case scenario would be from an ice cube tray so that they are all the same size)
- Timer (phone)
- Sunny day or Heat lamp

### **Class discussion:**

It is 115 degrees outside and you are attending an outdoor fieldtrip. What kinds of clothing might you wear? Any thoughts as to what materials it is made from (linen, wool, dry fabric (sports clothes), and cotton)? How about the color of the fabric?

Do you think the color you choose might take in more heat? Are there specific substances that are used where the color makes a difference as far as temperature? (Wearing black instead of white, walking on concrete vs walking on black asphalt, choosing a black car vs a white car, or leather vs cloth seats in your car?)

### **Terms to explore:**

- Conductor- material that transmits the flow of energy (electrons). **Metals are good conductors.**
- Insulator- materials that slow or stops the flow of electrons. **Concrete, glass, wood, plastic.**
- Reflection- the return of light or sound waves from a surface (mirror)
- Transparent- allowing most or all light to pass through
- Translucent- allowing some light to pass through (frosted glass vase)
- Opaque- no light passes through
- Thermal (HEAT) Energy- Vibration of atoms and molecules within materials. Faster they move, hotter they are.
- Light Energy- Radiant energy consisting of photons.

### **Procedure:**

- Place all 6 colored pieces of felt in a line in direct sunlight (or under a heat lamp)
- Use 6 of the same size ice cubes, and place them directly on top of the colored felt.
- Let the ice cubes sit in the sun until they have melted. Students should check them every few minutes and record which ice cubes melt 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup> and 6<sup>th</sup>.
- Place the data (time it took them to melt) in the data sheet provided.
- Create a bar graph representing the time it took the ice to melt for each piece of felt. Make sure to entitle the graph and label both axis.
- Answer the questions on the data sheet



**Questions to consider:**

1. **True or False?** A solar oven needs both thermal insulators and conductors to operate well.
  
2. An example of a **good conductor** is:
  - a. styrofoam
  - b. paper
  - c. wool
  - d. metal
  
3. What colors **absorb** solar energy best?
  - a. dark colors (black)
  - b. light colors (white)
  - c. primary colors (red, yellow, blue, green)
  - d. neon colors
  
4. What material(s) would work well in the walls of your home to help insulate it from the heat/cold?