

Teachers' Background Information

The light energy from the lamps is either reflected off shiny surfaces or light colored surfaces, or absorbed by dark surfaces and converted into thermal energy. Therefore, we would expect the dark paper, foam, and felt to absorb the light and become hotter. We would expect the white paper, foam, and felt, and the aluminum and Mylar to reflect the light and keep the surface underneath cooler. Thermal energy always transfers from an area of higher temperature to an area of lower temperature. Some materials, like cotton balls and felt, slow down this transfer of energy because they contain trapped air. Air is a very good insulator and slows down heat transfer very well. For this reason, double paned glass windows are preferable in houses because the air gap between the panes of glass slows down heat transfer either into the house on a hot day, or out of the house on chilly day. Similarly, fiberglass insulation in the walls and attic of houses contain this trapped air and slow down the rate of heat transfer.

Children often have the conception that “cold” is something that can be trapped. They may think that their penguin dwelling is trapping cold air. In a sense, they are right; the air inside the dwelling will be cooler than the air in the thermal oven. However, “cold” does not transfer; only heat transfers. The purpose of the dwelling is to prevent as much heat transfer as possible.

My students initially thought that that dark materials “attracted” heat like a magnet attracts paper clips. However, they learned that more light is absorbed by dark colors. Since more light energy is absorbed, more light energy is converted into thermal energy. Light materials look light to us *because* they reflect more frequencies of light energy! So, the lighter the color, the more energy is reflecting back to our eyes! My students were also initially wary of using fuzzy materials like felt and cotton, because of their experiences with these materials keeping them warm. However, after testing these fuzzy materials by themselves and inside the dwellings, they came to the conclusion that fuzzy materials did not necessarily get hot; the color was more important than the fuzziness.

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