



STEM on Site Summer Program

Olaf's Summer Home



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Recommended for Grade Levels: K-2

Content Notice

This activity has been put together as a free, open source resource from the Milwaukee School of Engineering STEM team for self-guided, at home learning. Unless otherwise noted, in person or live instruction is not provided and questions should be directed to stem@msoe.edu.

Curriculum has been adapted from [UC Boulder](#)

Safety Notice

Parents or guardians should review activity materials before students begin the activity. Some activities from MSOE may require cutting, hot gluing, electricity, manipulating sharp objects, and other tasks that may warrant adult supervision. MSOE is not liable or responsible for any injury, property damage, or other incidents that arise from completing these activities at home. If you have questions or concerns about any activities, please contact stem@msoe.edu

Note

Welcome to Building Olaf's Summer Home kit! Below you will find a few links to learn a little bit about Energy and Heat. We encourage you to watch the videos and review the Engineering Design Process worksheet with your child before starting your project.

This activity has been adapted from Teach Engineering's curriculum. MSOE has added videos and tips to adapt this activity to fit the at-home learning models currently being used during the pandemic.

Goals

- Understand that heat travels from places with the warmest temperature to places with the coldest temperature
- List examples of insulating materials
- Create a house that slows down the melting of an ice cube (prevent as much heat transfer as possible)

Materials List

Note that the goal for this activity is to see how heat transfer works. If you're gathering materials at home, feel free to try other materials if you don't have something below. Think of the purpose a material might serve and what items you have on hand that may do the same.

If you ordered a kit from MSOE, the items with asterisks (*) will not be included in your kit.

✓	NAME
	Cardboard (*)
	Plastic wrap (*)
	Aluminum foil
	Popsicle sticks
	Felt
	Foam (plates/cups)
	Construction paper
	Bubble wrap
	Plastic bottles (*)
	Newspaper (*)
	Ice Cubes (*)

REQUIRED TOOLS

	Writing tool for designing and drawing (*)
	Hot glue guns or other glue (*)
	Scissors (*)
	Tape (*)

Background Knowledge

How does heat transfer work?

https://www.youtube.com/watch?v=YK7G6l_K6sA

Which materials make good insulators?

https://www.youtube.com/watch?v=Yg8kXf_HKtU

Light energy can be absorbed or reflected. Dark surfaces and objects absorb light and convert that light to heat energy, making the temperature of that object feel warmer. Shiny surfaces and light-colored surfaces reflect light, making those objects feel cooler. White reflects all colors of light and black absorbs all colors of light. We see colors because of the light that is reflected to our eyes. For example, an object that appears red to our eyes is reflecting red light and absorbing all the other colors of light.

Heat energy travels from places with the warmest temperature to places with the coolest temperature. Insulating materials can slow down the transfer of energy. Some materials slow down this transfer of energy because they contain trapped air. Air is a very good insulator, meaning it can slow down heat transfer. For example, double-paned glass windows are used 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 cold day. Fiberglass insulation in house walls and attics contains trapped air, which slows down the transfer of heat energy.

It is a misconception that cold air can be trapped inside a structure. Cold does not transfer; only heat transfers. The goal of our Summer Home Activity is to prevent as much heat transfer as possible in order to keep the ice cube from melting. By keeping the heat out, we are making the inside cooler.

Building the House

1. Review available materials and discuss which materials might reflect light and keep the heat out.
2. Decide on materials and plan house on paper. Encourage your child to draw a picture and label or verbally state the materials they are using for each part of the house. Make sure they create a door or way to place the ice cube inside.
3. Build Time! As your child builds, they may find out their initial plan did work how they wanted. Remind them that engineers are always improving their designs and it's okay to make changes.
4. Once the house is complete put the ice cube inside and place the house in a testing area (outside in the direct sunlight).
5. Place another ice cube outside the house.
6. Set a timer for 10 minutes.
7. After 10 minutes check on the ice cubes and repeat every 10 minutes until the ice cubes have melted. Students should make observations noting differences between the 2 ice cubes. Encourage students to draw the changes in their ice cube and discuss what is happening.
8. Extension: Build a second house or make changes to the existing house by trying out different materials to see which ones prevent the most heat transfer.

Record Observations

Ice Cube in the House (pictures and/or descriptions)	Ice Cube Outside of the House (pictures and/or descriptions)
Beginning Stage:	Beginning Stage:
After 10 minutes:	After 10 minutes:
After 20 minutes:	After 20 minutes:
After 30 minutes:	After 30 minutes:

