

Cooling Costs and Insulation

Grades 6-8

Time frame 2-4 days depending on types of learners

Objective: To create an insulated unit that slows the melting of ice and keeps the ice frozen for longer. The premise is for the students to draw inferences from the activity to how they cool and keep their homes cool here in the coastal prairie.

Day 1:

Part 1

1. Have the students talk about good conductors and insulators. Ask students how they know if it will or will not conduct hot or cold temperatures.
2. Create a t-chart on the board or in their journals about materials that are good and poor conductors of hot/cold temperatures.
3. After they have a good list of each, then have them come up with their own definition of conductors and insulators.
4. Students will then pair or group up and come up with a group definition of conductors and insulators. Students will then do a gallery walk writing down what they like about others definitions and go back and do a final revision to their definition.

Part 2

1. Students will be given the project sheet, where they are given the task to create an insulated box that will keep the ice from melting. Before starting their projects, they should read the background information as a class and talk about what materials are currently used to insulate homes and foods.
2. Students will be allowed to use any household goods to keep the ice from melting. Students should then create a list of materials they may need and split it up between the group members.

Day 2

1. Students will build their insulation box and the teacher will facilitate the building by asking questions starting with have you thought about, could you also include, and how could you improve _____ aspect.
2. Once the insulation boxes are done a bag of ice cubes (approximately 4-5) will be measured and temperature taken prior to being placed in to the box. Students will keep their ice in their boxes and checked every 20-30 minutes for temperature and cube size. The group that keeps their ice frozen the longest can win some sort of teacher incentive. In some classes, we use bragging rights, or control over which playlist is played during independent work time.
3. Students should compare data, and discuss why certain groups did better than others based on materials. Extension- How would cost of the materials play a role in mass production
4. Students will then complete analysis questions and QR code activity.

Can You Keep It Cool?

Background Information: Conductors are made of materials that electricity or energy can flow through easily. These materials are made up of atoms whose electrons can move away freely. Some examples of conductors are:

- Copper
- Aluminum
- Platinum
- Gold
- Silver
- Water
- People and Animals

Insulators are materials opposite of conductors. The atoms are not easily freed and are stable, preventing or blocking the flow of electricity or energy. Some examples of insulators are:

- Glass
- Porcelain
- Plastic
- Rubber
- Wood
- Cotton
- Fiberglass
- For more information use the QR Code



According to the U.S. Department of energy, here are some of the materials used for insulating homes.

- Fiberglass- often found in rolls that appear to have a fibrous appearance. This is most often used on the inside of walls and floors to create a barrier for hot and cold temperatures.
- Concrete block- used to construct walls or floors and must be professionally installed.
- Foam board- goes in front of fiberglass insulation and adds an extra barrier to keep in hot or cold temperatures.
- Loose fill- which is a combination of fiberglass, cellulose (most often wood particles), and Minerals (rock or slag) wool this is often blown into the location that is needing the insulation.
- Sprayed foam- this consists of cement, polystyrene, polyurethane, and other minerals that are sprayed into place permanently; either in walls, ceilings, or attics.

Objective: To create a box to keep ice from melting for a longer period of time. Your job is to build a box or pouch to slow down the rate of ice in a bag from melting. Your container may be no larger than 12" x 12" x 12"

Materials: You may bring in any materials from home to use, but you must use the following materials: 1 zipper type bag, 4-5 ice cubes, 1 ruler, 1 thermometer or digital thermometer, Triple beam balance (these will be provided for you). Di]]

Procedure:

1. Select items you have at home or in school to create the best possible insulation box or pouch, assign jobs and come up with 2-3 ideas (Think about what coolers are made of already, how could it be improved)
2. Create a plan/design your box- this means you should create instructions on how to build your model, a diagram with measurements and labelling, so that other scientists can recreate your product. Assign each person materials that they are able to bring in.
3. Construct your model to test tomorrow.
4. Test your model and fill in your data in the table on your "Data Sheet"
5. Complete the analysis questions and QR Code questions using your phone or iPad

Data Sheet

Hypothesis: (put in if, then, because format):

Procedure

Data:

Time	Volume	Mass	Temperature
0 minutes			
20 minutes			
40 minutes			
60 minutes			

Conclusion

Conclusion Questions

1. How long did your insulation box/pouch keep the ice frozen?

2. How would you improve your invention?

3. What did you think your group did well?

4. What did other groups do well that you would like to try?

5. How is this investigation similar to cooling your home/apartment?

QR Code Conclusion Questions: Complete using your phone or iPad, remember to draw inferences from your lab.



1. How can insulation help your family conserve energy?

2. How can installing programmable thermometers save energy?



3. How much can an energy efficient refrigerator save your family a year?



4. What 5 things can you do to cool off right now?
