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| Frozen StEm Lesson | Grade Level: 3 and 4 |
| **Lesson Objective:**Students will create a device to help slow the melting of the snowman. | **Benchmark Standard:** SC.3.P.9.1Describe the changes water undergoes when it changes state through heating and cooling by using familiar scientific terms such as melting, freezing, boiling, evaporation, and condensation.SC.4.P.11.2 Identify common materials that conduct heat well or poorly. |
| **Essential Question:**3rd- How does heating and cooling cause water to change states?4th- Which materials provide the best insulation to protect the snowman from heat? | **Vocabulary:** FreezingMeltingHeat Solid Liquid ModelData table(Grade 4) Insulator, conductor | **Vocabulary Activities:**Acting out wordsUse words in explanation |
| **Preparation Directions:****Engage:**  Song and video from movie Frozen “In Summer” <https://www.youtube.com/watch?v=UFatVn1hP3o> **Procedures:**Explain that when summer comes Olaf will have to be transported to the north pole where it remains cold all year. An insulated container that will keep the heat out to prevent him from melting before he gets there is needed.Students will make models of snowman containers and use ice cubes to test their effectiveness. A thermometer can be used to check the temperature rather than opening the container and letting heat in.Once containers are built and ice is placed inside have students record the temperature every 20 or 30 minutes. Tip: Start recording temperatures in the morning and check throughout the day. Record temperatures in a data table.1. BRAINSTORM: Students should look at the available materials and discuss which to use.
2. PLAN/DESIGN: design a blueprint of a container.
3. BUILD: Students build their containers
4. TEST: Students test their containers with ice inside.
5. COLLECT AND ANALYZE DATA: Students draw containers in their notebooks and label. Students should record the temperature on a data table every 10 minutes for an hour. They should write and draw what the container did. Did it work or does it need to be improved?
6. REFLECT/IMPROVE: Students improve their containers using the data they collected and information they learned from seeing other groups test their containers.
7. EVALUATE/JUSTIFY: Discuss as a class, which container would be the best container for the Snowman and why?
 | **Materials:**Maker Space with a variety of materialsIce cubes**Science Tools:** Thermometer**Sample Questions:**3rd- Which materials prevented the heat from getting to the ice cube the best?4th- Which materials insulated the ice cube the best? How could you improve your design?What would happen to the snowman in the summer? |
| **Assessment:** Explain to Olaf what happens to frozen things in summer. Convince him that he should get into the container to be transported to a colder climate. Use the following words in your explanation:FreezeMeltHeat Solid LiquidGrade 4- Insulator |
| **Extension –** Place identical ice cubes on flat surfaces made of different materials including wood, metal, Styrofoam. Watch to see which ice cubes melt faster and slower. Discuss: Conductors pull in heat from the air and cause ice to warm more quickly. Insulators keep heat out better. |

What Will Olaf Do in Summer?



Challenge: Create a container that can be used to transport Olaf to a colder climate in the summer. The container should insulate him from heat.

Materials: You may use materials found in the makerspace and any recycled materials you bring from home.

Submission: You will present your data and your model to the class.