Power of Ice

Authors: Michigan Water Stewardship Program, Eaton Conservation District, based off of D.M. Candelora's 'States of Matter'

Lesson Overview: In this lesson, students will have the opportunity to conduct a science experiment that looks at the volume of water as it turns solid. Specifically, they will investigate how the lid of a container filled with water can be forced off when frozen.

Objectives: Students will be able to:

1. Write a hypothesis.
2. Discover what happens to water in the liquid and solid states.
3. Record data in an entry form.

This lesson meets the following Michigan Department of Education standards:

Next Generation Science Standards (NGSS):

- ✓ 2-PS1-4 Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.
- ✓ 2-ESS2-3 Obtain information to identify where water is found on Earth and that it can be solid or liquid.

Michigan Grade Level Content Expectations (GLCEs):

- ✓ S.IP.02.11 - Make purposeful observation of the natural world using the appropriate senses.
- ✓ S.IP.02.14 - Manipulate simple tools (ruler, meter stick, measuring cups, hand lens, thermometer, balance) that aid observation and data collection.
- ✓ S.RS.02.11 - Demonstrate scientific concepts through various illustrations, performances, models, exhibits, and activities
- ✓ P.PM.02.12 Describe objects and substances according to their properties (color, size, shape, texture, hardness, liquid or solid, sinking or floating).
- ✓ E.FE.02.13 Describe the properties (visible, flowing, melting, dew) of water as a liquid (lakes, rivers, streams, oceans).
- ✓ E.FE.02.14 Describe the properties (hard, visible, freezing, ice) of water as a solid (ice, snow, iceberg, sleet, hail).
- ✓ S.IP.03.11 - Make purposeful observation of the natural world using the appropriate senses.
- ✓ S.IP.03.12 - Generate questions based on observations.
- ✓ S.IP.03.15 - Make accurate measurements with appropriate units (centimeters, meters, Celsius, grams, seconds, minutes) for the measurement tool.
- ✓ S.IA.03.13 - Communicate and present findings of observations and investigations.
- ✓ S.RS.03.11 - Demonstrate scientific concepts through various illustrations, performances, models, exhibits, and activities.
- ✓ S.RS.03.15 - Use evidence when communicating scientific ideas.

Recommended Grade(s): 2nd and 3rd grade

Recommended Subject(s): Science **Duration:** Prep time: 2 min., Activity: 10 min, plus follow up

Materials Required: 1 towel, water, plastic (*not glass!) food storage box with lid, ruler, freezer

Suggested Vocabulary for Students: hypothesis, conclusion, solid, liquid, gas

Lesson Procedure:

Introduction:

~ Review the three states of matter. Discuss examples of liquids that turn into solids. One example is filling up an ice tray with water and freezing it. Has anyone done this before? What happened?

Activity:

~ We have seen that water increases in volume as it turns solid. What do you think will happen to a closed container that is completely filled with water and then cooled? Develop a hypothesis for the experiment.

~ For the experiment, fill the plastic food container to the top with water. Put the box on the towel on a counter or table. Put the lid on tightly. If the box is completely full, some water will squirt out when you put the lid on. Measure the height of the water.

~ Put the box in the freezer overnight. What happens? Measure the height of the ice.

~ When all of the ice has melted, measure the height of the water.

Wrap up / Assessment:

~ Explain what would happen if you put a can of soda in the freezer. If you wanted to try this at home, be sure to put the can in a tightly sealed plastic bag before placing in the freezer.

~ Where is water found naturally throughout the world as a liquid or frozen matter?

Adaptations/Extension/Enhancements:

~ Have the students come up with real-life examples that illustrate water's change in state from liquid to solid. In each case, what is the effect of the force?

~ Why is it important to drain hoses, sprinklers, and irrigation systems, and protect water pipes before winter arrives?

Additional Resources:

~ MWSP website: www.miwaterstewardship.org

~ Pipes rupturing after being frozen: https://www.youtube.com/watch?v=9MzPuKxsupo

Our MWSP logo represents the two hands of Michigan - both the upper and lower peninsulas - and caring for our water resources and water quality. The green hand symbolizes all vegetation and crops in our state and the tan hand symbolizes soils. The lighter blue water signifies the vast surface water throughout the state and the darker blue water denotes groundwater.