4H1750

# TEACHING SCIENCE

## ...when you don’t know diddly-squat

# What if ice didn’t float?

## Purpose:

The purpose is **not** to teach specific content, but to teach the process of science – asking questions and discovering answers. This activity encourages young people to try to figure things out for themselves rather than just read an answer on the internet or in a book. As a leader, try not to express your opinion, but let the youth engage in arguments based on evidence.

## Time required:

20 minutes or multiple days depending on the interest and questions the youth have

## Materials:

- ❏ Empty plastic jars (such as peanut butter jars)
- ❏ Sand
- ❏ Plastic grass (to be used as plants)
- ❏ Toy fish or water creature that sinks
- ❏ Water
- ❏ Ice or floating material that can be pushed down the jar for the experiment (polystyrene foam such as Styrofoam, or other material)

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### *SCIENCE PRACTICE:* Asking questions and defining problems

1. Ask youth: *Have you ever wondered about the impact of ice floating? What would happen if ice sank?* Allow them to share their answers. Don’t share your ideas. After they have given answers, follow up with more questions. *What might happen if ice did not float, but sank to the bottom?*

### *SCIENCE PRACTICE:* Developing and using models

2. Youth will build and use a model of a lake or pond to help them discover why it is important that ice floats.

### *SCIENCE PRACTICE:* Planning and carrying out investigations

3. Use a clear, empty container, such as a peanut butter jar, as a model for a pond and put in some sand, a toy fish and plastic grass. Fill about halfway with water. Put a piece of ice or foam on top and ask youth, how our lakes and ponds freeze.
4. Next allow the youth to push the foam or ice to the bottom of the jar and hold it there.

### *SCIENCE PRACTICE:* Constructing explanations and designing solutions

5. While the youth are holding the foam to the bottom of their lake, facilitate the conversation about what would happen if ice does not float. *What would happen to the plants on the bottom of the lake or pond? What would happen to the fish, snails, turtles and other animals that live in the lakes and ponds?*

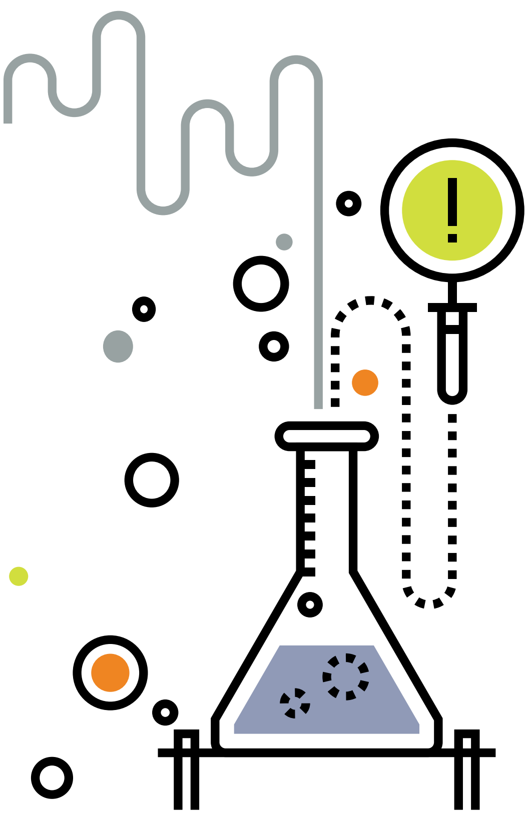
## More information:

Ice floats and stays on top. Ice slowly gets thicker, freezing our lakes and ponds from the top down. When lakes and ponds freeze, the ice on the surface forms pockets of air and helps insulate the water so it doesn’t freeze solid. Michigan lakes and ponds are home to a variety of plants and animals. Ice helps protect most aquatic plants and animals throughout the winter months. As ice melts in spring, it absorbs heat from the environment to slowly change its state back to liquid. Because it takes a lot of energy to change the state of water, this gradual process helps prevent a sudden increase in temperature that could be harmful to life.

## The science behind why ice floats:

*How does water decrease in density as a solid?* The answer can be found in the shape and polarity of water molecules. A water molecule is made up of two hydrogen atoms and one oxygen atom. The oxygen atom is in the center with the hydrogen atoms bonded to the oxygen almost like "Mickey Mouse" ears. Polarity refers to the slightly negative charge on the oxygen atom and the slightly positive charge on the hydrogen atoms, which attract other molecules so that the slight positive charges stick to the slight negative, linking water molecules together forming a structure with many empty spaces. In liquid water, the links are forming and breaking over and over as the molecules move so that the empty spaces don't stay empty. In ice (solid water) the molecules are barely moving, the links become more permanent and the spaces remain until the ice melts. Whether you see them or not, there are spaces within ice.

You do not need all the answers to teach science. You simply need an inquisitive mind and to be willing to carry out an investigation.



## Science & Engineering Practices:

These eight Science and Engineering Practices come from *A Framework for K–12 Science Education* (National Research Council, 2012, p. 42). These research-based best practices for engaging youth in science are connected to in-school science standards that all children must meet.

- Asking questions and defining problems
- Developing and using models
- Planning and carrying out investigations
- Analyzing and interpreting data
- Using mathematics and computational thinking
- Constructing explanations and designing solutions
- Engaging in argument from evidence
- Obtaining, evaluating, and communicating information

## Reference:

National Research Council. (2012). *A framework for K-12 science education: Practices, crosscutting concepts, and core ideas*. Washington, DC: National Academies Press.

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