Grade 02

ACTIVITY IDEAS
AIR AND WATER IN THE ENVIRONMENT
PROPERTIES OF SOLIDS AND LIQUIDS

SUPPLEMENTARY RESOURCE FOR VIDEO 3: A PLAYFUL CLASSROOM ENVIRONMENT

Index of learning opportunities:

About this guide:

This document is a companion guide to the Ontario Science Centre's video series on play-based learning, produced in partnership with the Ontario Ministry of Education.

"Play is a vehicle for learning and lies at the core of innovation and creativity."
- Ontario Ministry of Education

ONTARIO SCIENCE CENTRE
An agency of the Government of Ontario

LEARNING OPPORTUNITY:
ICE BALLOONS

What it's about:

- Students experiment with frozen water balloons using a variety of materials.
- This activity was originally shared by Exploratorium. Please visit this page for more detailed instructions.

Materials:

- A large bin filled with water, or individual bowls and a water bottle
- For each student/group:
  - Frozen balloons (see Exploratorium link, above, for details on filling and freezing)
  - Salt in shaker
  - Toothpicks and paper clips
  - Food colouring (can be diluted for younger students)
  - Trays (to contain mess)
  - Magnifying glass
  - Flashlight
  - Towel (to wipe hands)

Try it outside:

- This experiment has potential for mess; bring materials outdoors on a mild day.
- If you are low on freezer space, freeze balloons outside over a couple of cold winter days.
- Use a small amount of salt and nontoxic pigments (e.g., tempera paint or food colouring) to paint on ice outside. The salt creates interesting melting patterns, but avoid using large quantities.
- Have older students freeze balloons to prepare for the experiment. On a cold winter day, have students work in groups outdoors to build shelters for their balloons. Does the design of the shelters influence how quickly the balloons freeze? Note: It will likely take at least one day for the balloons to fully freeze.

Connections/Extensions:

- What happens if students sprinkle sugar on the balloon instead of salt?
- What happens if students try lifting an ice cube using some string and a bit of salt?
- Ask older students what happens if they measure the volume of water in the balloon (e.g., measure the diameter of the sphere, displacement of water, etc.) before and after freezing.
- Students may notice that it's easier to chip away at the ice with a paper clip, compared to a toothpick. For older students, this would be a good link to conductors and insulators.

Observations from prototyping:

- We diluted the food colouring and had few issues with mess.
- Because of our own constraints, we provided all the materials at once. Passing them out one by one, as described in the Exploratorium instructions, would likely encourage more detailed observation.
- We distributed a small amount of salt, because students used all the salt in the shakers.

See next page for sample instructions and prompts.

Optional: Print the instructions and place them in a T-stand.

ICE BALLOONS

Experiment with frozen water balloons

Safety notes:

- ✓ Never eat or drink your science experiments.
- ✓ The food colouring will stain. Use only one drop at a time.
- ✓ Make sure anything wet stays in the bowl.
- ✓ Tidy up your spot when you finish.

Look closely at the ice:

- Use the flashlight and the magnifying glass.

Things to notice and try:

- Look for air trapped in the ice. Where do you think it came from?
- Use the paper clip and toothpick to chip at the ice. Which tool works better?
- Carefully sprinkle salt on the ice. What happens?
- Carefully add one drop of food colouring to the ice.

LEARNING OPPORTUNITY:
SNOWFLAKES AND SYMMETRY

What it's about:

- Students explore rotational symmetry with mirrors and simple building materials.

Materials:

- Microscopic images of snowflakes
- Placemats to mark work area (optional)
- Interesting building materials, such as toothpicks, foam pieces, Styrofoam spheres and plastic "gems"
- Angled mirror sets (two acrylic mirrors joined on the outside with fibreglass tape)

  Note: Use plastic mirrors, not glass ones, for lightness and durability. Two locker mirrors (with no border) taped together is a practical, inexpensive option if custom cut mirrors are not available.

Try it outside:

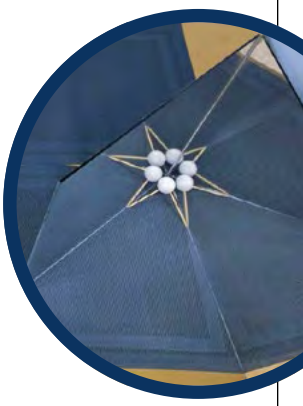
- Have students catch snowflakes on a snowy day and photograph them to sketch later.
- As a class, look for examples of rotational vs. bilateral symmetry in nature.
- Make small versions of the hinged mirrors to take outside, or bring small single mirrors (compact or locker mirrors) outdoors to experiment with reflection and symmetry.

Connections/Extensions:

- Students can take photos of the interesting shapes they create.
- Students can cut snowflake shapes from paper (such as inexpensive coffee filters or higher-quality paper) and use the mirrors to change the snowflakes' appearances.
- Another option is to use different materials with the mirrors (beads, cut coloured paper, sequins) for a kaleidoscopic effect.
- Students can use MIRA tools to contrast rotational symmetry with bilateral symmetry.

Observations from prototyping:

- This activity was easy to set up and take down.
- It can be hard for groups larger than two to share mirrors, because of the limited range of view.
- The mirrors work well with a variety of objects (hands, faces, loose parts, building materials, etc.).



See next page for sample instructions and prompts.

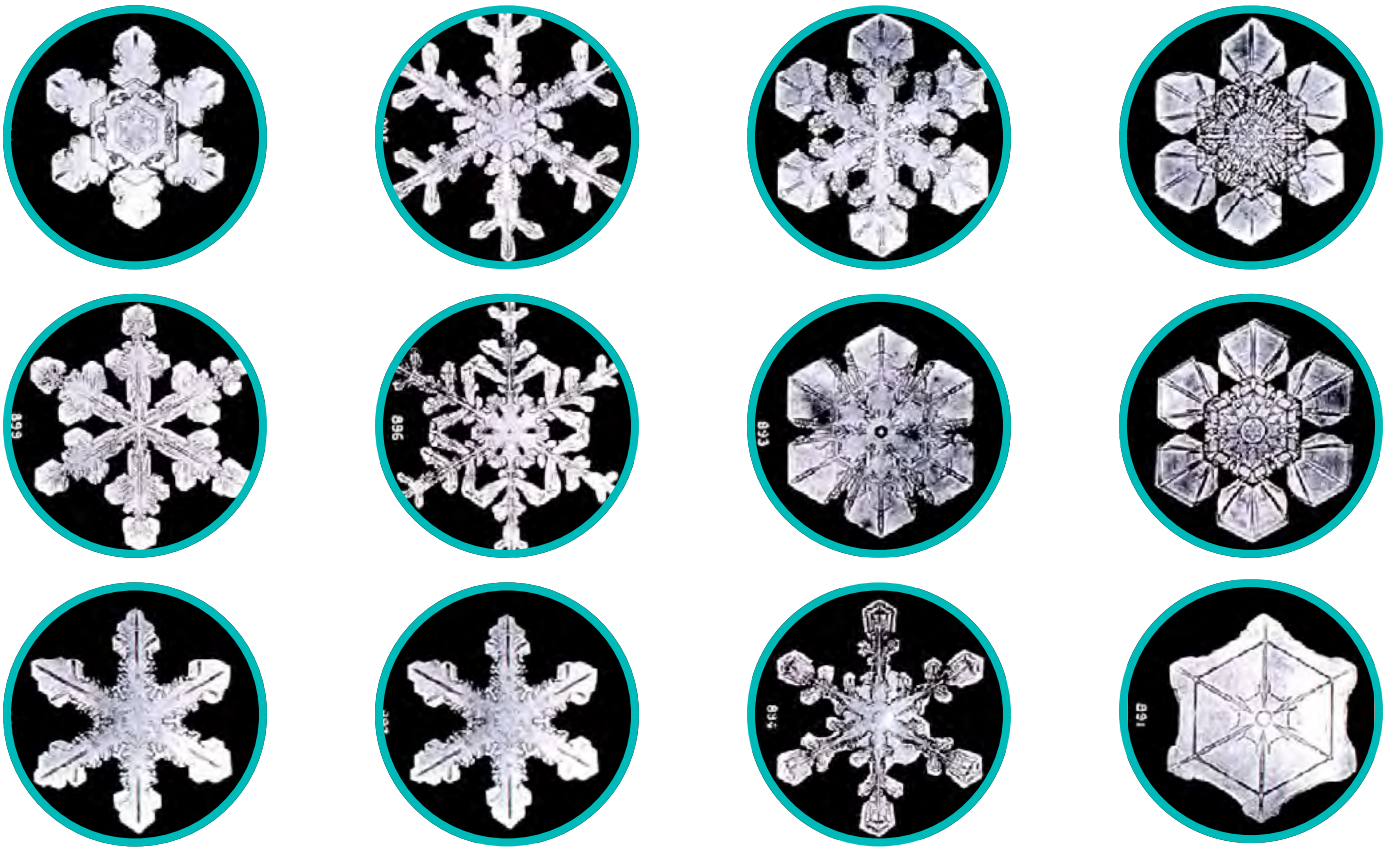
Optional: Print the instructions and place them in a T-stand.

SNOWFLAKES AND SYMMETRY

Explore rotational symmetry

1. Use the mirrors to make one toothpick look like six!
2. Use the materials and the mirrors to make something that reminds you of a snowflake.
3. Can you count how many sides your snowflake has?

Don't forget to put everything away when you're done!



LEARNING OPPORTUNITY:
WATER BEADS

What it's about:

- Students experiment with super-absorbent polymer beads.

Materials:

- Plastic table covering
- For each student/group:
  - Polyacrylamide beads (we found ours in the floral section of Canadian Tire)
  - A large tray to keep water contained
  - Measuring spoons and a dropper
  - An ice cube tray (each slot can be an individual science experiment)
  - A tray to hold the beads and a small beaker for the clear beads (to avoid colour bleeding)

Try it outside:

- This activity can get messy, so it would be great to take outdoors on a warm day.

Connections/Extensions:

- Help students observe how the clear beads "disappear" in water. Because they are made mostly of water, light passes through them in a similar way.
- Compare how the beads appear in salty water vs. freshwater.
- For a fun twist on chemistry (pH) experiments, soak clear beads in red cabbage juice (made by soaking red cabbage leaves in boiling water, or by blending cabbage and water).
- Provide a labelled ice cube tray with different materials (vinegar, lemon slices, baking soda, soap, etc.) for students to experiment with.
- It's fun to watch the beads expand over time (it takes about a day). If possible, involve students in this process (and with making cabbage juice, if you choose to).
- Disposable diapers contain a similar absorbent polymer, for related or at-home experiments.
- Math opportunities include representing growing or shrinking patterns, partitioning whole numbers with concrete materials, creating a repeating pattern by combining two attributes, counting by 1's, 2's, 5's and 10's, etc.
- For younger participants, this activity offers good connections to colour mixing.

Observations from prototyping:

- Students were fascinated by the texture of the beads and enjoyed mixing them with water.
- We tried the cabbage juice experiments with rotating stations, but it was hectic to replenish consumables. Consider trying it as a whole group activity, or empower older students to replenish consumables themselves.
- We created a "slosh bucket" for students to discard beads after chemistry experiments.
- Hydrate beads the day before you need them so that they have enough time to soak up water.
- The beads will take on a musty smell if you store them in a closed container. Consider storing them in the fridge if you need them for several days.

See next page for sample instructions and prompts.

Optional: Print the instructions and place them in a T-stand.

WATER BEADS

Observe how water beads behave

Safety notes:

- ✓ Never eat or drink your science experiments.
- ✓ Keep all beads and water on the tray.
- ✓ Beads are slippery. If one falls on the floor, pick it up.
- ✓ Tidy up your spot when you finish so the next person can have fun too.

Things to notice and try:

- Use the spoon to put beads into the ice cube tray.
- Use the magnifying glass to look closely at the beads.
- Can you make a clear bead disappear?
- Can you make a bead float?

Math challenges:

- Try counting your beads by 1's, 2's, 5's and 10's.
- Use the ice cube tray to create a growing pattern of beads.

LEARNING OPPORTUNITY:
MAKE IT FLOAT

What it's about:

- Students use materials to construct a structure that floats.
- Students place their structure in a big bin of water to test its ability to float. Then, they add glass beads until it reaches its breaking/sinking point.

Materials:

- Large bin of water for testing
- For each student/group:
  - Building materials, such as foam spheres, corks, toothpicks, aluminum foil, cut pool noodles, etc.
  - A large bin filled with water
  - A container of glass beads, metal nuts or coins for testing the structure
  - A towel to clean up spills

Try it outside:

- This can get messy. Bring the experiment outside on a warm day!
- If you are close to a lake or ocean, visit a marina and observe the structure of different boats.
- Visit a wetland and observe/ investigate the structure of floating aquatic plants (e.g., duckweed, pond lilies, etc.).

Connections/Extensions:

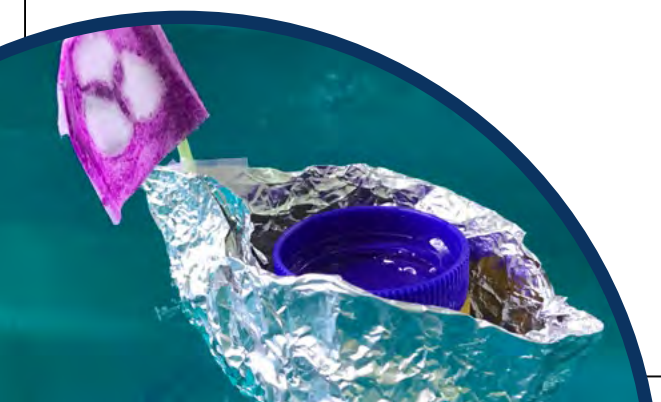
- Ask students to predict how many beads their structures will hold.
- Ask each group to report the number of beads their structures held (the greatest number of beads or the average number of beads over multiple trials) and graph the results.
- Record how many beads each structure supported. Work as a class to try for the largest possible number of beads (add everybody's together, so that everyone is contributing and it isn't a contest between individual students or groups).
- Older students could also record the ratio of number of parts to number of beads held.
- Look at connections to buoyant structures (boats, diving gear, swim bladders in fish, aquatic plants, etc.).

Observations from prototyping:

- It would be interesting if students could photograph their results.
- Near the end of the activity, some students put all materials into the water bin (they did keep the water inside the bin, though).
- When we prototyped this with adults, we found that very large pieces of foil were easy to form into a boat shape, and the activity lacked challenge. Small pieces of foil encouraged creative solutions.

See next page for sample instructions and prompts.

Optional: Print the instructions and place them in a T-stand.



MAKE IT FLOAT

Use the materials to build something that floats

Safety notes:

- ✓ Make sure the water stays in the tub.
- ✓ Always work carefully with the water in the tub.
- ✓ Tidy up your spot when you finish so that the next person can have fun too.

Test your structure!

How many objects will your structure hold?

Make a guess, and then try it out!