

# Problem Solvers Activity SE 8: Exploring Ice

## CHILDREN ARE LEARNING...<sup>1</sup>

### Science Content:

- Sunlight warms the Earth's surface.
- Ice melts faster when exposed to sunlight and/or heat.
- Water can be both a solid (ice) and a liquid (water).

## CHILDREN ARE DOING...

### Science Practices:

- Make observations
- Collect and analyze data
- Make predictions

**NOTE:** This activity needs to be done on a sunny, warm day so that children can observe differences in ice melting in sun vs. shade. If that's not possible, substitute a lamp as a heat source, taking care that only the teacher touches the lamp.

### Materials Needed:

At least one dozen ice cubes

A stopwatch or phone timer

1 plastic bowl for every 2 children

2 heat-safe bowls (e.g., sturdy plastic) for every 2 children—each should be able to hold 8 ounces of water and several ice cubes

2 plastic cups to hold ice cubes

16 ounces of very warm water, stored in an insulated bottle

16 ounces of room temperature or cold water

2 small plates

1 piece of chart paper

Marker

Optional: Magnifying glasses, 1 per pair of children

<sup>1</sup> Adapted from the Next Generation Science Standards (kindergarten): <https://www.nextgenscience.org/>

## PREPARATION:

- **For the ENGAGE activity:**
  - For every 2 children, put 2-3 ice cubes in a plastic bowl. Hint: Rinsing the ice cubes first can make them more pleasing to touch.
- **For the EXPAND activity:**
  - Have the cold and very warm water prepared and ready to go.
  - Place 4 ice cubes in each cup—try to wait until right before you do the activity, so they don't melt too much. You will also need 2 bowls per pair of children.
- **For the EXPLORE activity:**
  - Prepare the chart paper with the headings below. Have the stopwatch/timer, 4-6 ice cubes, and plates ready to take outdoors. If you choose to use the magnifying glasses, have these in a bag or basket ready to go outside as well.

I KNOW	I WONDER

## Activity Instructions

### ENGAGE

Gather a group of 4 to 6 children (increasing supplies as needed for 3 vs. 2 pairs of children).

**PREPARE:** Bring the two bowls of ice cubes to the group.

**ASK:** Explore what children know and understand about ice by using questions like the ones below:

- What is this? What can you tell me about what's in the bowl?
- What do you notice about the ice?
- When do you use ice? Where do you see ice?
- What happens when you have ice in a drink?
- What do you know about ice?
- What do these ice cubes look like and feel like?
- When we touch the ice, what happens to it?
- What happens to ice on a hot day?

Give pairs of children time for free play with the ice (5-10 minutes) before moving on.

**ASK:** While you were playing with the ice, did it change? What is different about the ice now?

**NOTICE:** The longer the ice is out, the more it melts. When we started exploring the ice cubes, they were solid and there was no water in the bowl. Now the ice cubes have more water on them and in the bowl. The ice is melting a little bit, isn't it? Melting is what happens when ice turns from a solid cube to liquid water.

**TRANSITION:** Today we are going to explore ice and see what we can do to make ice melt!

## EXPAND

**PRESENT:** Give each pair of children two bowls and fill each with water—one with very warm water (that is very warm but not too hot to touch), one with very cold water. Keep the ice cubes handy.

**ASK:** Let's each put our fingers in the bowls of water. Can you tell me if the water feels warm or cold? *(Elicit children's feedback on temperature.)*

**ASK:** Now we are going to put two ice cubes in each bowl of water. Do you think the ice cubes will melt faster in the warm water or cold water? What makes you think that? *(Encourage children to make a prediction and share their thinking.)*

**TRY IT:** Let children drop the ice cubes into the two bowls. Encourage children to watch the cubes as they change in the water. If they wish, they can stir/touch the cubes while they observe.

**NOTICE:** Ask children what they see and how the ice cubes are changing. Re-state/summarize their observations.

**EXPLAIN:** Water melts ice. Warm water melts ice faster because the heat from the warm water moves to the ice and melts it. We can also say the heat is *transferred* from the water to the ice.

**TRANSITION:** Now we are going to do another test with our ice cubes – this time outside!

## TEACHER'S TIP:

Developing a scientific hypothesis requires having a strong, research-based understanding of science content.

Young children are just beginning to gather understandings in science from their observations and learning experiences. They do not have the background information needed to develop hypotheses.

But—when you invite them to wonder about “what will happen if” or “what will happen when,” you are helping them gain experience in thinking like a scientist!

## EXPLORE

### NOTE TO TEACHERS:

The **EXPLORE** activity that follows is perfect to do during scheduled outdoor play as it takes approximately 30 minutes as children observe how an ice cube melts in the sun outside. If you do the activity inside under a lamp, children can periodically check the ice across the day to observe how it is changing.

**EXPLAIN:** Today we are going to experiment with ice. We are going to see if ice melts faster in the sun or the shade.

**ASK:** What does it feel like to be in the sun? What does it feel like to be in the shade? *(If you need to define shade: Shade is when the light from the sun is blocked by an object and creates a shadow, like under a tree.)*

**DISPLAY** the prepared chart at children's level.

**ASK:** Let start by thinking about our experiences with ice and what we know about ice and sunlight. We're going to put your ideas on this chart. *(Use the questions below to guide the discussion.)*

- This first column says: I know *(point to this column on the chart)*. What did you discover when we did our experiment with ice and water? What do you know about ice? What makes ice melt? *(Write children's thoughts on the chart.)*

- The second column says: I wonder (*point to this column on the chart*). What do you wonder about when you think about ice and melting? What questions do you have about ice and melting? What do you think might happen when we put ice in the sun? How about when we put ice in the shade? (*Write children's thoughts on the chart.*)

**TRANSITION:** Gather the children and take the group outside. Bring the ice cubes and plates with you, along with the stopwatches.

**TRY IT:** Restate the experiment for the children: *We are going to put one ice cube in a sunny spot and one ice cube in a shady spot. Then we'll be scientists and observe what happens to our ice cubes while we are outside playing.*

**ASK:** Ask the children to give you ideas for where to put the two ice cubes (sunny vs. shady location).

- Talk about the benefits/drawbacks of different locations (What makes this a sunny spot? Where is the shade?)
- Have children touch the ground in the sunny/shady areas they are considering. Ask how the ground feels (warm/cool).
- Once locations are selected by the group, ask children to place the ice on plates in those spots.

**EXPLAIN:** Now we're going to be scientists and observe what happens in our experiment. We'll stop every 5 minutes to check our ice cubes as a group, but you can check them as often as you like! But remember: We can't touch or play with our ice cubes because our hands are warm. What might happen if we touch the ice with our warm hands? (The ice can melt.) We can only observe with our eyes.

**OBSERVE:** Keep an eye on the ice cubes and set a timer (such as on a phone) for every 5 minutes (plan to stay outside for 30 minutes). When the timer goes off, call children over to make observations and comparisons between the cubes in the sun and shade. Document children's observations in the notebook. You can also notice/ask about how children feel in the sun/shade.

**NOTE:** You may need to remind children not to touch or pick up the ice cubes. If it helps, you can provide children with water/ice to use for outdoor play during this activity. If desired, you can distribute magnifying glasses to allow children to look at the ice cubes closely.

**EXPLORE:** Use questions like those below to prompt children's thinking and observations:

- Which cube looks bigger/smaller? What do you think is making it get smaller? What do you think is happening?
- It's been five minutes. Do you think the ice cube has changed during that time?
- I'm observing some water around the bottom of the ice cube. Where do you think that water came from? What do you think is happening?
- The ice cube in the sun is getting very small. What do you think is making it melt so quickly?
- The ice cube in the sun is completely melted. Let's see what is happening with our ice cube in the shade. What do you see? Why do you think the ice cube in the shade is not melting as fast as the one in the sun?
- Does anyone remember which cube melted the fastest? Which ice cube took longer to melt?
- **At the end of the activity:** What did we learn about how the sun's heat affects ice?

If you wish, bring the group back inside to close the activity.

**SUMMARIZE:** Help children develop a fuller understanding of the processes happening in this experiment, using the guiding points below. Supplement this explanation with children's observations from your time

outside. Be sure to address the questions or curiosities that children noted in the “I Wonder” section of the chart as you close the activity.

- The sun warms the earth, or the land and water all around us. The heat from the sun moves, or is transferred to, all the surfaces that it touches. That’s why the ground feels warm in a sunny spot.
- The ice cube in the sun melted faster because it absorbed more heat from the sun.
- The ice cube in the shade melted a little bit, but not as much as the one in the sun. That’s because it didn’t get as much heat from the sun while it was in the shade.
- In today’s experiment, we discovered that ice is the solid form of water. When ice melts, it turns into a liquid—water.

## REFLECT

Take some time to review the chart and choose some of the questions below to close the activity:

- What did we discover about ice and melting today?
- Tell me what happened during our ice experiment outside.
- What happened to the ice cube in the sun?
- What happened to the ice cube in the shade?
- What can we add to the I Know ideas in our chart?
- Do you have any new wonderings you’d like to add to the I Wonder part of our chart?

**SUMMARIZE:** Today we learned that the sun helps to warm the earth. The heat from the sun was transferred to the ice cube and melted it.

## Individualizing the Activity

### Make it more challenging:

- For the **EXPAND** activity, transfer the warm and cool water into child-size pitchers and let children pour it themselves into the bowls.
- In the **EXPLORE** activity, provide children with paper, markers/pencils, and a clipboard to draw/record their own observations. They can also dictate to you what they see happening, as you write their words down.
- Using a kitchen scale, help children weigh the ice cube at the beginning of the activity and at the end of the activity. Does the ice cube weigh more, less, or the same after it melts?
- Take photographs at the beginning, middle and end of the activity. Print several copies of these and invite children to put them in order and “tell the story” of what happened in the experiment.

### Make it less challenging:

- In the **EXPLORE** activity, place the ice cube only in a sunny location. Guide children to observing what happens. Focus on the connection between exposure to sun/heat and the ice melting.
- Take photographs at the beginning, middle and end of the activity. Print these and place them in order to “tell the story” of what happened in the experiment. These visual cues can prompt children whose working memory is still developing.

## MAKING CONNECTIONS ACROSS THE DAY:

- Add ice to sensory play. You can add ice to water tables indoors and out. During art, you can paint with ice cubes outdoors. (Freeze ice cubes with craft sticks for a handle and invite the children to “paint” with them on sidewalks.) Note the differences in the speed of melting when children work in the sun vs. the shade.
- Encourage children to notice how the play equipment, sidewalk, pavement, or doorknobs in the sun get very warm. (What is happening? The heat from the sun is being transferred to these surfaces.)
- Prompt children to notice how they feel playing in the shade vs. the sun on a warm day. Do they notice that they feel warmer in the sun?
- During meal or snack time, consider adding ice cubes to pitchers of water and observe what happens—do they get smaller (melt) or stay the same? Why is that? (The liquid in the pitcher is a little warmer than the ice cube so its heat is transferred from the liquid to the ice...and melts it.)

## Song: *Ice Is Melting*

**Materials Needed:** Glass with ice and water, glass with just water

### Verse 1

I went out on a sunny day. (Raise arms in a circle)  
The warm sun made me want to play. (Dance in place)

I set a glass of water by the pool (Pretend to drink from a glass)  
It had some ice to keep it cool. (Shiver like you're cold)

I splished and splashed and had some fun (Pretend to swim in place)  
But when I looked, the ice was gone! (Look surprised)

### Verse 2

I went out on a sunny day. (Raise arms in a circle)  
The warm sun made want to play. (Dance in place)

I set my glass out in the shade (Pretend to drink from a glass)  
With ice cubes in my lemonade. (Shiver like you're cold)

When I came back from jumping in the grass (Jump up and down)  
There was still some ice in my glass! (Look surprised)  
(Four slow drips in time) (Optional: Lift up a finger to count each drip)

### Refrain

Melting, melting, ice is melting (Arms up in the air, fingers wiggle downward)  
The sun was warm, it heated the glass (Pretend to mop sweat from brow)  
Melting, melting, ice is melting (Arms up in the air, fingers wiggle downward)  
The ice, it melted so fast! (“Melt” body fast to the ground)

Melting, melting, ice is melting (Stand; Arms up in the air, fingers wiggle downward)  
The shade was cool, and we all know (Shiver like you're cold)  
Melting, melting, ice is melting (Arms up in the air, fingers wiggle downward)  
When it's cool, the ice melts slow! (“Melt” body slowly to the ground)

## Making Literacy Connections

Share the following book with children as an opportunity to deepen their understanding of the freezing/melting cycle of water..

**Suggested Book:** *Ice Boy* by David Ezra Stein

### AS YOU READ:

- On the first page when we meet Ice Boy, ask children what Ice Boy is. (He is an ice cube—just like the ice cubes they used today for their science activity. Ice Boy is part of an Ice Family!)
- The story talks about ice cubes being taken and used to cool down someone's drink. Ask children if they have ever had ice in their drink. What happened to the ice in their drink?
- The book mentions that ice can be used in a *cold compress*. Explain that a cold compress is a bag filled with ice that is placed on an injury—like when someone hurts their arm or knee. Another word for it is *ice-pack*. Have children ever had ice put on one of their boo-boos? What did it feel like?
- Ask children why they think Ice Boy's doctor told him to never go in the sun. (Notice what is happening in the picture—is Ice Boy sweating in the sun or...melting? What do children think?)
- When Ice Boy goes to the beach, he gets in the water. Ask children if they remember what happened when they put ice cubes in the bowl of water. What do they think will happen to Ice Boy?
- Why did Ice Boy's name change to Water Boy?
- On the "Vapor Boy" page, explain that when water gets really, really hot it stops being a liquid and becomes *vapor*, which is like steam.
- When Ice Boy "whizzes through the sky in a summer hail," you might need to explain what that is. Hail is when little balls of ice fall down in a storm instead of raindrops.
- Note: If you want to simplify the story, you may want to skip reading the text in speech bubbles and/or summarize the story.

### BUILD ON THE BOOK: ICE PLAY

Materials: Ice tray filled with cubes, four bowls filled with water (very cold, room temperature, warm, and almost-hot water), spoons

Show children how ice cubes can be removed from the ice tray. Let each child choose an "Ice Boy" or "Ice Girl." Let children put their Ice Kids in the bowls of water, experimenting with different temperatures of water. They can use the spoon to move the cubes in and out of the bowls. Notice together when Ice Boy becomes Water Boy!

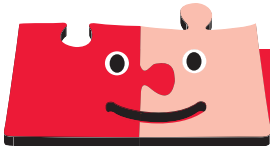


### Ice Observations

This week, children are learning about how the sun's heat can melt ice. Children are also learning how water can be solid (ice) or liquid (water). You can help them learn at home by trying some of the activities below.

- **Explore melting!** Help your child put ice cubes in a bowl of warm water and ice cubes in a bowl of cold water. Observe how the ice cubes change. The heat from the warm water is transferred to the ice and melts it!
- **Notice how solid ice can turn into liquid water.** Let your child put an ice cube in a plastic (child safe) cup. Notice how ice is very hard and solid. Leave the cup on the table. Let your child check it every once in a while. Notice together how the ice cube changes. After the ice cube melts, notice how it has become a liquid: Water! If your child wants, they can drink the water they made from melting ice.
- **Notice how the sun warms the earth.** When you are outside with your child on a sunny day, let them touch (if it's not too hot) the pavement, playground equipment, or the side of a car or building. If it's in the sun, does it feel warm or cool? Let your child touch something in the shade: Is it warm or cool? What makes them feel different? The heat from the sun warms the earth and everything around us!





## Solo para familias

# Observaciones sobre el hielo

Esta semana, los niños están aprendiendo cómo el calor del sol puede derretir el hielo. También están aprendiendo que el agua puede ser sólida (hielo) o líquida (agua). Usted puede ayudarlos a aprender en casa con algunas de las actividades que se indican a continuación.

- **¡Descubra el deshielo!** Ayude a su hijo a poner cubitos de hielo en un bol de agua caliente y cubitos de hielo en un bol de agua fría. Observe cómo cambian los cubitos. La energía térmica del agua caliente se transfiere al hielo y ¡lo derrite!
- **Observe cómo el hielo sólido puede convertirse en agua líquida.** Dígale a su hijo que ponga un cubito de hielo en un vaso de plástico (seguro para niños). Indique que el hielo es muy duro y sólido. Deje el vaso sobre la mesa. Deje que su hijo lo observe de vez en cuando. Observen juntos cómo cambia el cubito de hielo. Cuando el cubito se derrita, vean que se ha convertido en un líquido: ¡Agua! Si su hijo quiere, puede beber el agua que hizo derritiendo el hielo.
- **Fíjense en cómo el sol calienta la Tierra.** Cuando esté al aire libre con su hijo en un día soleado, deje que toque (si no hace demasiado calor) el pavimento, los juegos del parque infantil o el lado de un auto o la pared de un edificio. Si está al sol, ¿siente calor o frío? Deje que su hijo toque algo a la sombra: ¿está caliente o frío? ¿Qué lo hace diferente? La energía térmica del sol calienta la Tierra y todo lo que nos rodea.

