Water

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Part 1: *Looking at Water*, page 8

Water on Various Surfaces

Boston Schoolyard Initiative Extension

When to Go Out

Following Part 1, bring students outside to investigate how water interacts with different surfaces.

Outdoor Objective

Students will be able to describe how water interacts with various surfaces outdoors and compare these interactions with the experiment done inside.

Materials

For Each Student	Science notebook
	1 Clipboard
	1 Pencil
For Each Group	1 Vial
	1 Large plastic cup of water with lid
For the Class	Extra water in case of spills
	Extra pencils

You may want to fill the vials with water and cap them for your students. Decide if your students would spill less measuring themselves or when opening the vials.

Getting Ready

Time: 20–30 min.

Site: Choose a site that contains a variety of possible surfaces: pavement, grass, hard-packed dirt, loose soil in garden area, concrete, large rock, log, etc.

Conservation: When you are finished, pour leftover water onto plants. Make this a rotating job for students. Remind them that it is important not to waste water and that plants need water to live.

Guiding the Investigation

1. Decide whether you, or your students, will select the various surfaces on which they will pour water. This will depend on whether your students are ready for a more independent experiment or need more guidance.

Outdoor Activities At a Glance

Investigation 1

Water on Various Surfaces (BSI Extension)

Water on an Outdoor Slope (BSI Extension)

After a Rainstorm (FOSS® Extension)

Investigation 2

Keeping Water Cold (BSI Extension)

Investigation 3

Evaporation Locations

Investigation 4

Waterwheels

Priority activities appear in green.

"I couldn't have set the stage for the rest of the Water unit any better if I had tried! Students loved doing this activity outdoors. They were all able to predict what they'd see."

Judean Patten-Clark
Science Specialist

What You Might Find:

If students finish early you may want to instruct them to try a different location. A good choice would be a slight variation on one of the first three choices. For example, on a sloped hardtop area versus a flat hardtop area.

Students will be eager to discuss their results after completing the outdoor investigation. It is not essential to address all misconceptions at this point. This is an opportunity for students to explore their understanding and share their ideas.

2. Before going outside tell students that they will pour one vial of water on three different locations and observe what happens to the water. Remind students how to measure one level vial.
3. Set up science notebooks: Have students set up their notebooks inside, by putting the date and title on their notebook page. If you have pre-selected the surfaces students will use, have them label their notebook with those three sites leaving enough space under each for illustrations and descriptions of their observations. If students are selecting their surfaces, have them write site number 1, 2, and 3 (to be labeled outdoors with the specific location).
4. Outdoors, students should go to the surfaces they wish to test. Some may need help identifying three possible locations.
5. Students then measure one vial and slowly pour it (in one spot) on the selected area.
6. When water has been absorbed or is clearly done moving down the slope and has pooled in one location, students should record what happened to the water.
7. Students then move onto the second and third locations and repeat.
8. Leave time for students to discuss their results.

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Part 3: *Water on a Slope*, page 19

Water on an Outdoor Slope

Boston Schoolyard Initiative Extension

When to Go Out

Following Part 3, take students outside to pour water on different slopes and surfaces. Due to the large amounts of water used, this works best as a class demonstration.

A Note on Rain: The results of this lesson vary drastically depending on how much rain you have had. For example, on a steep dirt slope, after a lot of rain, you may discover that the poured water will not run down the hill as predicted, but will soak into the ground quickly. When the weather has been drier for a few days, on this same slope, most of the water will run down the hill with very little absorbed by the earth. Most of the time the water on a steep slope travels the farthest (excluding the paved area).

On a gradual slope, students will witness that the water is absorbed more by the earth and does not travel as far. The gradual slope does not seem to be as impacted by the amount of rain. The water travels to the lowest point, moves slowly, and does not go much more than 1–2 meters.

Students should see that water on steeper slopes runs faster and farther than on more gradual slopes. If it has rained a lot, you may not see this. Although this is still a valuable lesson, it may confuse your students. If the water on a steep slope soaked into the ground immediately, then discuss the results with your students and try the lesson again when it is drier, and then compare the results. Doing this activity on drier earth materials supports the lesson in the **Water Module** more directly.

Outdoor Objective

Students will observe and describe what happens to water poured on various outdoor surfaces and slopes and compare the results to those observed in the classroom activity.

Materials

For Each Student	Science notebook
	1 Clipboard
	1 Pencil
For the Class	4–5 2-liter bottles of water

Getting Ready

Time: 45 min.

Site: Select four different slopes. All sites have surfaces worth exploring. Try to have surfaces as similar as possible (e.g., packed dirt) so the changing variable is the slope. Here are some suggestions:

- "Flat" paved surface (black top in schoolyard)
- "Flat" dirt surface
- Gentle sloping surface (dirt or grassy area)
- Steep incline or hill if you have them on site (dirt or grassy area)

Seasonal Tips: If doing this activity in the winter, be careful not to pour the water on areas where students walk and could slip on ice.

"The level of excitement that comes with this activity is just incredible."

Michelle Teleau
Science Specialist

"I love doing an activity inside and outside because you're doing something very cold the first time. The second time they're constantly taking something from what they did inside but then they're applying it to the reality of outside."

Eric Meuse
Science Specialist

What You Might Find:

This is an exciting and engaging activity. Students will want to cheer on the water as it slowly makes its way across the pavement. It is worth being patient and waiting for the water to make it to the drain. It will be very exciting and eye-opening when it makes it there.

You may need to remind yourself that students are learning, and this excitement should be acknowledged and not seen as a behavior problem. (Put those overly excited students to work carrying water!)

All schoolyards are different and have great surfaces for this experiment. Think openly about your schoolyard before dismissing this activity as one you cannot do.

Guiding the Investigation

1. Tell students that you will slowly and steadily pour equal amounts of water on four different slopes and surfaces and observe what happens. Have students set up their notebooks before going outside. Leave at least a half a page for each surface.
2. Outdoors have students gather around to observe a student volunteer pour water onto the paved "flat" surface. The water will flow toward the nearest drain. **(Do not point out the drain yet!)**
3. Have the student pour 2 liters of water in a slow and steady stream onto the pavement in one spot (do not spread the water out).
4. Students should record what they observe immediately after the water stops moving.
5. Ask students why the water went to the drain. At this point, tell them the designers of the play area/parking area intentionally sloped the pavement to the drain to conduct rainwater away from the building.
6. As a group, move to the next location and repeat the pour. Chose another volunteer to pour this time.
7. Have students record their observations in their notebooks after each location.
8. Repeat until you have poured water in all four locations.
9. Instruct students not to block the streams of water with their shoes or any other object. If the water comes to them, they should move out of the way. If the water naturally flows towards a rock or stick, instruct students to leave it there and observe what happens.

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After a Rainstorm

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When to Go Out

After a rainstorm, take students outside to observe the effects of flowing water and erosion. If there is a dirt pile somewhere in the schoolyard, look there first. Also look at the bottom of slopes for channels made by the flowing water.

Outdoor Objective

Students will see evidence that water flows down slopes in the schoolyard and moves earth materials with it.

Materials

For Each Student	Science notebook
	1 Clipboard
	1 Pencil

Getting Ready

Time: 15–20 min.

Guiding the Investigation

1. Ask students where they might expect to find erosion, and have them spread out to look.
2. When students first find signs of erosion, gather together to discuss what they found. Ask, *Is this erosion the result of water flowing? How can you tell? What evidence is there that the flowing water moved earth materials from one place to another?*
3. Ask students to look around the schoolyard for other examples of erosion.

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Part 3: *Water as Ice*, page 19

Keeping Water Cold

Boston Schoolyard Initiative Extension

When to Go Out

Following Part 3, bring students outside to build a container to keep water cold (or hot).

Outdoor Objective

Choosing from a variety of construction materials, students will design an insulated container to keep water cold (or hot), and then test their relative effectiveness.

Materials

For Each Group	1 chilled vial of water (Part 2)
	Scissors (Part 1) (The teacher should carry these out and distribute once groups are sitting.)
For the Class	Various materials such as foil, foam, felt, sand, plastic bags, boxes, cotton balls, newspaper, or other things that could be used as insulators (Part 1)
	Extra chilled vials of water in case of spills (Part 2)
	Tape

Gather the various materials listed above and equally divide the materials into boxes or bags (one per group). Also distribute equal amounts of tape to each group. Wrap the tape around a craft stick for easy distribution. (To do this quickly, use the length of your desk to measure pieces of masking tape and then wrap.)

To distribute equal amounts of sand, fill bags of sand, put one on each side of a balance and make equal, take one bag off, put another on, and make equal. Repeat until all the bags weigh the same amount.

Give the vials several hours to chill by placing them in the back of a refrigerator where it is coldest.

Getting Ready

Time: 2 sessions: One 45–60 minute session to build the insulated containers. The second session is for making observations: 10 minutes at the beginning and 10 minutes at the end.

Seasonal Tips: If doing this during the winter, you could use warm water in the vials instead and try to keep them warm. In winter, you probably want to do Part 1 of this lesson inside and Part 2 outside.

Conservation: When students finish their insulated containers, gather the leftover materials to reuse or recycle.

Guiding the Investigation

Part 1:

1. Ask students how they think they could keep water cold. Accept all answers.
2. Tell students that today they are going to build a container with their groups to keep water as cold as possible. Then they will test how well their containers work during the next class.
3. Students may only use the materials in the bags distributed to each group.
4. Take the class outside to the building spot. Students can spread out with their groups and begin building. To add a bit of excitement to the activity, do not let students open their bags until you say, "Begin building now!"
5. Once the building begins, give students time updates and remind them that after 40 minutes (or the time you allot), they will not be able to modify their design.
6. When time is up, have students collect all materials and bring them back inside. They should label their creations with their group name. You may want to collect the scissors yourself.

Part 2:

1. Carry the vials of cold water and the thermometers outdoors. The students should bring their containers, notebooks, and pencils.
2. Select a site that has partial shade. Set up near the shade, but not in it. Students will sit with their groups.
3. Pass out the vials and thermometers. Have students measure the temperature of the water, then place a cap on the vial, and put the vial into their containers.
4. Wait 30 minutes. You could read a selection from the *FOSS Science Stories* or do one of the extensions in the module.

"This activity really served to introduce students to the idea of good insulators. I thought it was a good real-world application of the hot and cold water explorations from Investigation 2."

Judean Patten-Clark
Science Specialist

5. During the last 10 minutes of class (wait as long as you possibly can), take the vials out of the containers and measure the temperature.
6. Students should record the temperature of their vial.
7. In the classroom, create a chart listing each group, the insulators in the group's container, and the first and second temperature reading. Which insulators worked the best? Ask if anyone did anything else to try to keep their container as cool as possible. Ask, *How could we find out for sure which insulator was the best?*

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Part 2: *Evaporation Locations*, page 12

Evaporation Locations

When to Go Out

Following Part 2, take students outside to expand this investigation. Refer to the FOSS Teacher Guide for complete instructions.

Outdoor Objective

Students will expand their experiment by adding an outdoor location.

Getting Ready

Site: Select an outdoor location in an area that won't be trampled by students (possibly a fire escape). Be aware that wind may tip the cup over. You could put a rock in the cup to weigh it down; technically this would raise the water and change the surface area, which would increase the evaporation time. Also, rain may fill the cup, but these are both issues you could discuss with your students.

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Part 2: *Waterwheels*, page 12

Waterwheels

Try doing this activity outside instead of inside. It's a wet one! Refer to the FOSS Teacher Guide for complete instructions.