

Unit 1  
What is the  
Water  
Cycle?

Activity B

# Can you make dirty water clean?

## Introduction

In the previous lesson, students observed the physical properties of water and its three states. In this activity, students will apply this understanding to a lesson on water purification and the water cycle. Specifically, students will construct a model that both simulates the water cycle and purifies water by changing the states of water from a liquid to a gas and then back to a liquid.

## Scientific Learning Goals and Objectives for this Activity:

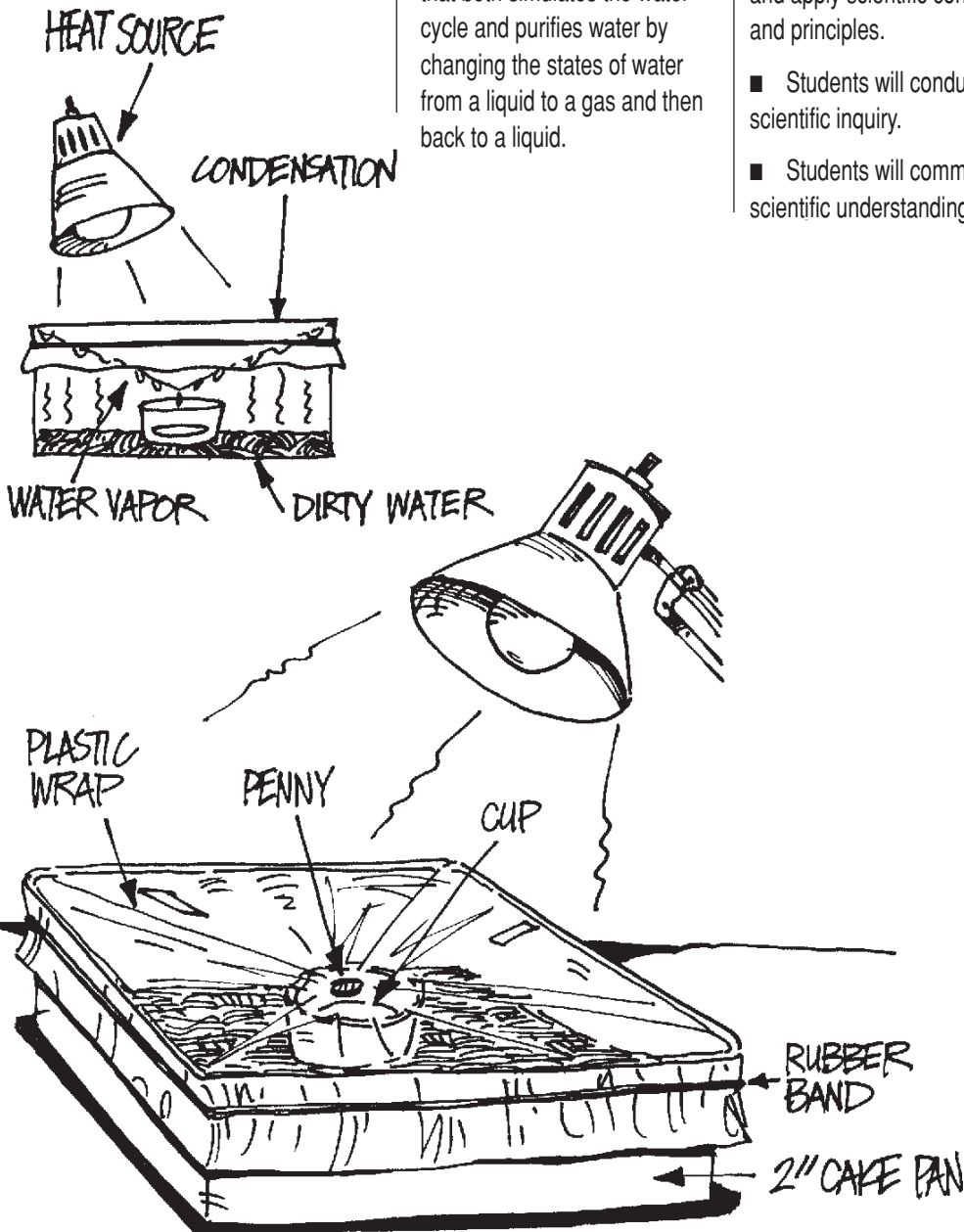
(Goals from Washington State Commission on Student Learning — Essential Learning Requirements for Science)

### Goals

- Students will understand and apply scientific concepts and principles.
- Students will conduct scientific inquiry.
- Students will communicate scientific understanding.

### Objectives

- Students will demonstrate understanding of the need for water to change states in order to be cleaned (purified).
- Students will apply knowledge by building a model that demonstrates the collection of clean water from a sample of dirty water.
- Students will communicate understanding that water is a finite resource that is being cleansed and distributed by the water cycle.



## Teacher Preparation

**Preparation Time:**  
20 minutes

### Materials

Prepare for the Entire Class:

- transparency of world water distribution map
- large container with dirty H<sub>2</sub>O (mix in class with oil, dirt, rocks, Kool-Aid, lint, etc.)
- plastic wrap
- paper towels
- cloth towels
- funnels/coffee filters
- aluminum screen/soil screens
- cheesecloth
- steel can/sand & gravel (optional)
- foil
- hot pads
- any additional items available that students may use in experiments

Prepare for Demonstration:

- square aluminum cake pan, 2" depth
- bottom of plastic cup, taped down
- large rubber band
- penny/metal washer
- heat source (sun, heat lamp, bare bulb)

Prepare for Each Team:

- clear container for team water sample (jar)
- square aluminum cake pan, 2" depth
- metal sauce cup or custard cup
- large rubber bands
- pennies
- heat source e.g., sun, heat lamp, bare bulb

Prepare for Each Student:

- copy of journal page

## VOCABULARY

Atmosphere	Subsurface Water
Condensation	Surface Water
Evaporation	Transpiration
Ice Caps	Vapor
Oceans	Water/Hydrologic Cycle
Oxygen	
Oxygenate	
Precipitation	
Purification	

## Student Involvement

**Activity Time:**  
Day One—  
50 minutes  
Day Two—  
50 minutes

### Activity Processes:

#### Day One:

? *Where is water located in the world?*

1. Present an overhead of world water distribution map. Remind students of the three states of water. For each category listed on the map, ask students to predict/estimate the percentage of water this represents in the world. After discussion and consensus, write in the actual percentages determined by the U.S. Department of the Interior/ Geological Survey. These are: ice caps and glaciers 2.15%, surface water .02%, subsurface water .63%, oceans 97.2%, atmosphere (at sea level) .001%.

? *How can clean water become polluted?*

2. Students add a variety of materials to class container of water, e.g., oil, dirt, Kool-Aid, rocks, etc. Discuss how local water sources may become polluted. Place container on table with materials prepared for entire class.

? *How can you create a water cycle to make dirty water clean again?*

Have students imagine they are in a desert. They are hot and thirsty but have run out of water. They find a pond but the water looks dirty (dirty water from step two). Using only what's in their backpack and the clothes on their backs (teacher provided materials), have them clean up the water to drink.

3. Teams design a water purification system using any available materials in three to seven minutes. Encourage each team to utilize changes in states of water as part of design. Students sketch and describe their system in journal.

4. Each team builds purification system. Using class sample of dirty water, teams test their system. Common methods tried include filtering and boiling the sample. Many substances are removed by these methods. The Kool-Aid color, however, will remain.

5. Teams that finish first record results in journal and present to class. Place team samples together on a table to compare color and clarity.

? *How much of the initial water sample is left?*

Discuss success/failure of each system type. For results with systems that need more time to work, leave overnight and continue discussion/presentations the next class period.

6. Teacher should assemble

## Student Involvement Continued

demonstration model and place in inconspicuous place in room to begin purification process for next day's lesson.

### Day Two:

1. Continue team presentations of systems. Discuss similarities and differences between system designs.

2. Teacher presents demonstration model from Day One. Compare and contrast demonstration model to student team systems.

*? Why is water found in different places in the demonstration model? How did it get there?*

Encourage students to utilize vocabulary such as: evaporation, condensation, and precipitation. Each student should describe in their journal each place where water was present in the demonstration model and why.

3. Relate water in the model to water found naturally, such as polluted rivers or lakes and precipitation such as rain or snow; clouds (water vapor).

*? How is water purified in nature?*

Fully define the term water cycle or hydrologic cycle. Relate this to what happened in the purification system. Students draw and label a landscape that shows the water cycle in their journal, include the 3 states of water. Arrows can be used to indicate the direction of the change of state. Encourage students to share sketch with team members.

## Notes

Teachers may allow students to design and test models over a period of days as an independent project or extra credit.

### Day 1

Step 4:

Teacher should initial design before students begin construction. This will assure safety with hot plates and other ideas that may be potentially dangerous. Students should not drink any of the contaminated water.

### Day 2

Step 2:

The water in the cup is clean, and has gone through the water cycle. However, it has traveled only a short distance from the plastic wrap to the cup. Thus, the water will not contain much oxygen and will taste flat like when you leave water in a glass and the water tastes "stale." At this point, you can also ask the class, "How does water oxygenate during the water cycle?" Explain that precipitation takes in oxygen and other gases when it passes through the atmosphere.

Step 4:

You can also introduce and explain the term transpiration. To demonstrate, place a small baggie over a house/potted plant (or just a leaf or stem) and observe captured water vapor. This reflects the part of the water cycle where plants and animals give off vapor as part of their natural processes.

If room is available, keep working models assembled for a few days. Allow students an opportunity to monitor the models' progress daily.



# Journal 1B

## Can you make dirty water clean?

Name \_\_\_\_\_

Team Name \_\_\_\_\_

Date \_\_\_\_\_

Sketch and label your team's water purification system.

Describe how you think your team's system will work.

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Teacher's initials \_\_\_\_\_

## Journal 1B Continued

### Can you make dirty water clean?

What were the results of your team's water purification system?

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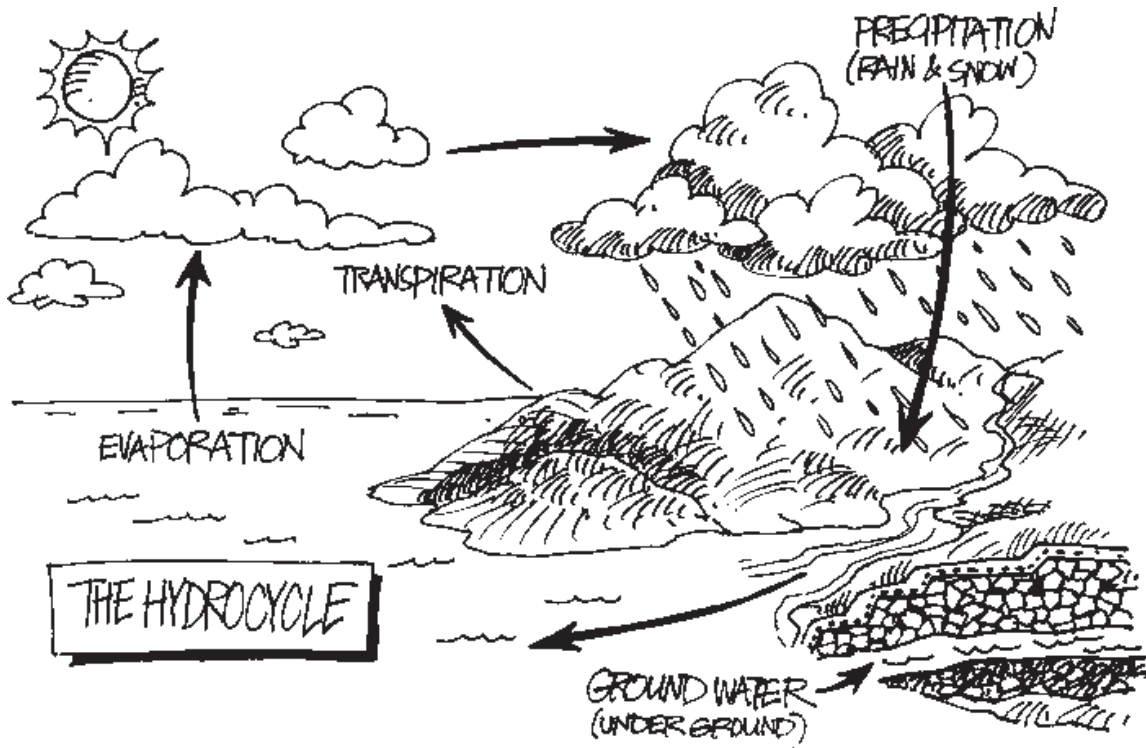
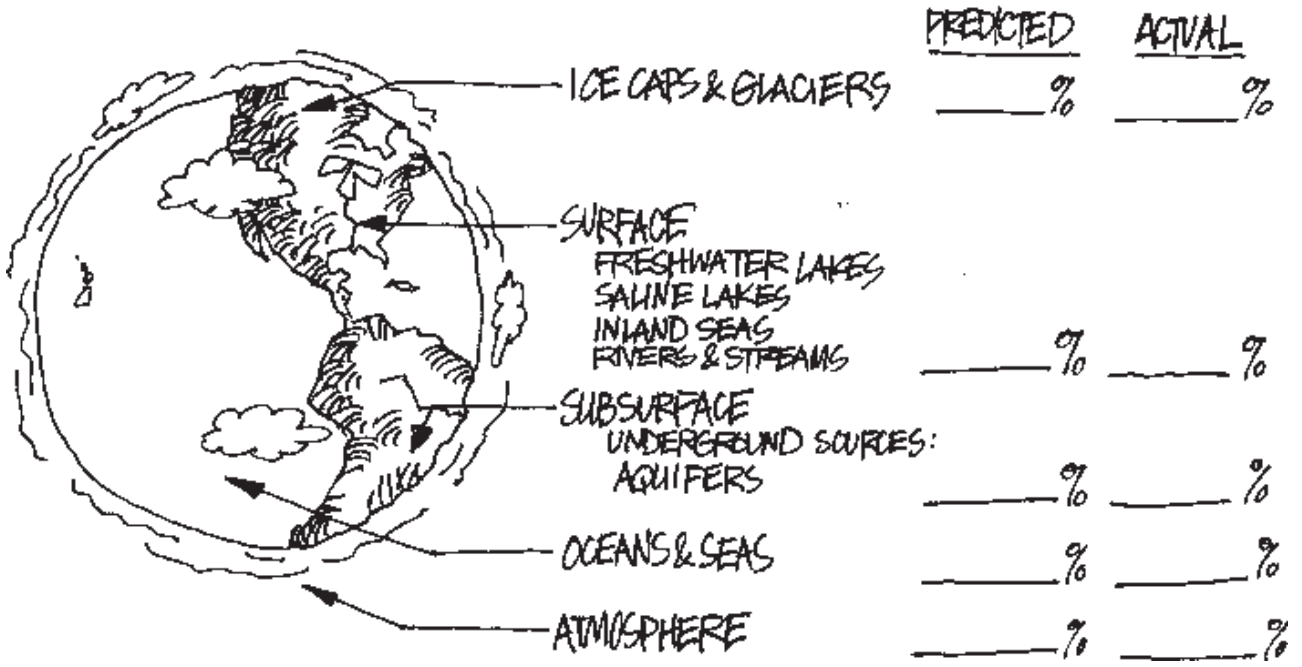
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Draw and label a landscape that shows the water cycle. Show water in each of three states: solid, liquid, and vapor. Use arrows to show the direction of changes in state (For example: clouds → snow or rain).

# WORLD WATER DISTRIBUTION MAP



Note: An excellent lesson for teaching world water distribution is located in [Earth: The Water Planet](#) (see Resource List).