

WATER CYCLE STUDY USING RANDOM NUMBER CUBES

Background:

Water plays a part in each of the nine areas that are investigated in the activity. Water accumulating in a various location can have a variety of exits:

Soil –

The soil is saturated, and water runs off into a river.

Water is absorbed by plant roots.

Water remains on surface adhering to soil particles.

Water filters through soil into a river.

Heat energy is added to water puddles on the surface and evaporates into the clouds.

Water remains on surface in puddle, so it remains with soil.

Lakes—

Lake water is pulled by gravity, and it filters through soil into groundwater.

Water remains within a lake or estuary.

Water flows into a river.

An animal stops by the lake for a drink, and water goes to the animal.

Water absorbs heat energy from the sun and evaporates into the clouds.

Cattails at the edge of the water use water for photosynthesis: it goes to plants.

Animal—

Water is incorporated into the body cells: it stays in the animal.

Water is incorporated into the body cells and is respired through breath into clouds.

Water collects in the animal's fur or on its skin and remains on the animal.

Water is incorporated into the body and evaporates through pores into clouds.

Water in animal cells is excreted through feces and urine and goes to soil.

An animal running to escape a predator pants rapidly. Water droplets hit the ground, and goes to soil.

Plant—

Water in the plant is used to make a flower, so it stays with the plant.

Water on the plant evaporates into the clouds.

Water in the plant is used to make plant cells, so it stays in the plant.

Water is in a plant leaf that is eaten by a hungry animal.

Water is taken from the roots to the leaves, so it stays with the plant.

Water leaves the plant leaf through transpiration going to the clouds.

Clouds—

Water condenses and falls on soil.

Water condenses and falls into oceans

Water condenses and falls into lakes.

Water condenses and falls as snow onto glaciers.

It's a beautiful day, so water vapor stays in clouds.

Clouds produce rain which falls into oceans.

Groundwater—

Water seeps from shallow groundwater and moistens soil.

Water remains in the Ogallala Aquifer.

Water is forced up in a mountain spring and begins a stream that becomes a river.

Water percolates down through gravel to become more pure groundwater.

Water is pumped out of the ground to irrigate a crop: it goes to soil.

Water remains in shallow levels (or “perch water”) as groundwater.

River—

Grass growing along the bank takes in water. It goes to plants.

Water remains in the current of the river.

The river flows into an ocean.

An animal drinks the water: it goes to animal.

The river flows into a lake.

Heat energy is added to the water, so the water evaporates into clouds.

Ocean—

Heat energy is added to the water, so water evaporates and goes to clouds.

Water is pulled by gravity and goes into groundwater.

Water remains in the ocean floating among fish.

Heat energy on wet objects in ocean, so water evaporates and goes to clouds.

A pelican dips down and grabs a fish and a beak full of water. It goes to the animal.

Water blows waves, and the water remains in the ocean.

Glacier—

Ice melts and water filters into the ground into groundwater.

It stays very cold so ice remains in the glacier.

Ice melts and evaporates into the clouds.

Deep ice cannot be reached by heat and stays in the glacier.

Ice melts, and the water flows into a river.

Pieces of glacier “calve” into the sea, and it goes to the ocean.

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Overview:

The grid shown indicates nine places that water can stay momentarily during the water cycle. You need to define random number cube (*at one time called “dice”—shhh!*) numbers for each of the nine stations.

Since water droplets falling to the earth accumulate in difference places on the earth’s surface and stay in these places for varying amounts of time, the dice at each station vary. By using the dice, the students will begin to understand that the patterns of the water cycle vary according to the location of the falling water droplets.

Soil	Plants	Rivers
Lakes	Clouds	Oceans
Animals	Groundwater	Glaciers

Directions:

Use the information on the next page to define the sides of the random number cube for each box.

Then follow the procedure for conducting the activity.

Defining the Sides of the Random Number Cube for each Box:

Soil Station Cube

1, 4 = River
2 = Plants
3, 6 = Stay*
5 = Clouds

Plant Station Cube

1, 3, 5 = Stay*
2, 6 = Clouds
4 = Animals

River Station Cube

1 = Plants
2 = Stay*
3 = Oceans
4 = Animals
5 = Lake
6 = Clouds

Lakes Station Cube

1 = Groundwater
2 = Stay*
3 = River
4 = Animals
5 = Clouds
6 = Plants

Clouds Station Cube

1 = Soil
2, 6 = Oceans
3 = Lakes
4 = Glaciers
5 = Soil

Oceans Station Cube

1, 4 = Clouds
2 = Groundwater
3, 6 = Stay*
5 = Animals

Animals Station Cube

1, 3 = Stay*
2, 4 = Clouds
5, 6 = Soil

Groundwater Station C u b e

1, 5 = Soil
2, 4, 6 = Stay*
3 = Rivers

Glacier Station Cube

1 = Groundwater
2, 4 = Stay*
3 = Clouds
5 = Rivers
6 = Oceans

*“Stay” means the water droplet stays at the station.

Procedure:

Divide the room into the 3x3 grid shown on the first page and label each square.

Number students off, 1 to 9, with each number making up a group. Assign each group to a square. Have the students on each square form a line.

The students become the water droplets and are responsible for recording their own paths in the water cycle. Each student has a piece of paper with the name of each of the stations. Students take turns throwing the die at the station, recording where he/she goes, and going there. (*Example: Student 1 at the Glaciers Station makes a tally mark by Glacier Station on his/her paper. When he/she shakes the die, he/she might get “Stay.” He/she makes another tally mark on his/her paper and goes to the end of the line at the same station. When he/she gets another turn, he/she might get “rivers,” so he/s makes a tally by the River Station on his/her paper and goes to the end of the line at the River Station.*)

The activity continues with the water droplets (*students*) flowing around the room in the pattern of the water cycle and making tally marks as they go. After about 20 minutes, the teacher stops the flow of the water droplets and has each student add up his/her tally marks for each station.

Students then go to their original group and add up their totals for each station. The teacher then calls for each group totals and puts them on the board to come up with one large group total for each of the 9 stations. At this point, the students discuss which stations have the largest totals and forecast possible causes for the differences.

OPTIONAL: A small group of students can then take these totals and enter them in a spreadsheet using Microsoft works, word, excel, or Clarisworks. From the spreadsheet, they can create graphs that will show them the percentage of time that the water droplets were at each station.

VARIATION: Students can calculate the averages using calculators, and graph them in groups on butcher paper, news print, or posterboard.

WATER CYCLE ACTIVITY
Summary Sheet

1. How many times were you at each station?

Soil _____ Plants _____ Rivers _____ Lakes _____
Clouds _____ Oceans _____ Animals _____
Groundwater _____ Glaciers _____

2. What were the totals for your group?

Soil _____ Plants _____ Rivers _____ Lakes _____
Clouds _____ Oceans _____ Animals _____
Groundwater _____ Glaciers _____

3. What were the overall totals for your class?

Soil _____ Plants _____ Rivers _____ Lakes _____
Clouds _____ Oceans _____ Animals _____
Groundwater _____ Glaciers _____

4. Which stations have the largest totals? Why do you think this is true?

5. Prepare bar graphs for your data, your group's data, and your class's data.