

Incredible Journey Water Cycle Game

*A lesson from the New Jersey Agricultural Society
Learning Through Gardening program*

OVERVIEW: Picture a class of students scurrying all over the room, pretending they are drops of water moving through the water cycle. A roll of the dice might send them evaporating into the clouds, condensing into the ocean, or transpiring from a plant. All the while they record their journey, by collecting colored beads at every stop or making tallies. The Incredible Journey game brings the water cycle to life in a fun, engaging way!



OBJECTIVES: The student will be able to:

- describe the movement of water within the water cycle
- identify the states of water (solid, liquid, and gas) as it moves through the water cycle
- describe the process of evaporation, condensation, and precipitation of water as it moves through the water cycle
- define transpiration
- identify places that hold water as it moves through the water cycle such as soil, plants, animals, lakes, rivers, clouds glaciers, and oceans

GRADES: 2-5

MATERIALS:

9 large pieces of poster board

Pictures of the nine water cycle stations (soil, ground water, plants, animals, lakes, rivers, clouds, glaciers, and oceans) *Included in this lesson.*

9 small, square boxes about 6 inches on each side (*To increase the pace of the game, use an extra box at the clouds and ocean stations.*)

Labels for the sides of the dice. *Included in this lesson.*

My Journey Through the Water Cycle tracking sheet OR

Chenille stems and pony beads of nine different colors for each student

PREPARATION:

You will need to make the dice and the station signs before you play the game with your class. The preparation takes a bit of time, but once the game is made, you can use it over and over again and share it among classes.

Copy the dice labels included with this lesson. For the dice sides, you will need the following numbers of labels:

Animal 2	Clouds 14	Glacier 1	Ground Water 4	Lake 4
Ocean 3	Plant 1	River 4	Soil 3	Stay 18

The dice labels for each station are different. Glue the dice labels onto the sides of the boxes according to the list in the Water Cycle Table Chart below. Write the name of the station on the die that goes with it.

Next make signs for the nine stations. Photographs and labels for the stations are included in this lesson. You can paste the photos and labels provided with this lesson onto poster board, or you can have your students create the signs.

BACKGROUND:

Water is always in motion. It travels through lakes, rivers, oceans, the atmosphere, ground water, plants, and animals. Its path is known as the *water cycle*. Water changes forms – or states - as it moves through this cycle, from solid (ice), to liquid, to gas (water vapor). As water passes from one form to another, its path can change.

The sun directly influences the rate of the water's motion. When the motion of the water molecules increases because of an increase in heat energy, water will change from solid to liquid to gas. With each change in state, physical movement from one location to another usually follows. Glaciers melt to pools which overflow to streams, where water may evaporate into the atmosphere.

Gravity also impacts the way water travels over, under, and above Earth's surface. Water as a solid, liquid, or gas has mass and is subject to gravitational force. Snow on mountaintops melts and descends through watersheds to the oceans of the world.

When water is in liquid form its movement is easiest to see. Water flows from streams to rivers and tumbles into the ocean. Water travels slowly underground, seeping and filtering through particles of soil and pores within rocks.

But water's most dramatic movements happen unseen, when it is in the form of gas. Water is constantly evaporating, changing from a liquid to a water vapor. As a gas, it can travel through the atmosphere over Earth's surface. In fact, water vapor surrounds us all the time.

Water condensation can be seen as dew on plants or water droplets on the outside of a glass of cold water. In clouds, water molecules collect on tiny dust particles. Eventually, the water droplets become too heavy and gravity pulls the water to Earth. Humans and animals also help move water, carrying it in their bodies from one place to another.

Plants are the greatest movers of water among living things. The roots of plants absorb water. Some of this water is used inside the plant, but most of it travels up through the plant to the leaf surface. When water reaches the leaves, it is exposed to the air and the sun's energy and is easily evaporated. This process is called transpiration. Transpiration from plants accounts for 10% of the water vapor in the atmosphere.

PROCEDURE:

Before starting the lesson, spread the nine station pictures around the room, leaving as much space between them as possible. Place each station's die beside the picture.

Ask a student to come up and take a sip from a glass of water. Ask the class, Did you know that same water _____ just swallowed could be the same water that a T-Rex drank from a river 65 million years ago? Water constantly moves in a cycle around the Earth, and that same water has been recycling for more than four billion years.



Ask students if they know the different forms water can take. Review the states of matter: solid, liquid, and gas. Review what happens to these different types of water during the water cycle:

Evaporation: Evaporation is when the sun heats up water in rivers, lakes, or oceans and turns it into vapor or steam. The water vapor or steam leaves the Earth and rises into the air.

Condensation: In the atmosphere, the water vapor sticks to dust particles, forming clouds. Water vapor in the air gets cold and changes back into liquid. This is called condensation. Condensation is then followed by precipitation.

Precipitation: Precipitation begins when small condensed drops of water join together in the clouds until they become too heavy and gravity pulls them down to earth. The water falls back to the earth in the form of rain, hail, sleet or snow.

Transpiration: Do plants sweat? Well, sort of.... People perspire (sweat) and plants transpire. Transpiration is the process by which plants lose water vapor from their leaves.

Ask students to identify the different places water can go as it moves around Earth. Write their responses on the board. Tell students that they are going to play a game in which they become water molecules moving through the water cycle. Categorize the places water can move through into nine stations: Clouds, Plants, Animals, Rivers, Oceans, Lakes, Ground Water, Soil, and Glaciers.

Explain that water movement depends on energy from the sun and gravity. Sometimes water will not go anywhere. It will get "stuck" for a long time in one place. Ask students in which of the nine stations they think water is likely to become stuck (oceans, ground water, glaciers).

Divide the class into nine groups and assign each group to begin the game at a different station. Tell the students that in this game, they are going to be drops of water or water molecules (depending on their age and understanding.) Ask students to discuss in their groups where they think water can go from their station in the water cycle, and what would cause the water to move. Most of the movement from one station to another will take place when water is in its liquid form, however, any time water moves to the clouds, it is in the form of water vapor. After students have come up with lists, have each group share their work.

Ask the students to line up single file in their groups. Tell them to place a bead on the pipe cleaner at the station where they start or make a mark on their tally sheets.

Tell students to keep track of their movements. This can be done in two ways: have the students list each station they visit on the *My Journey Through the Water Cycle* tracking sheet. Or place a bowl of different colored beads at each water cycle station. Give each student a chenille stem and tell them to make a knot at the bottom. Tell the students when they arrive at every station, they should take a bead and put it on their chenille stem.

Tell students that one by one, they will roll the dice to find out where they go next. If they roll *stay*, they must move to the back of the line and wait to try again.

Start the game. Expect to play for 20 to 30 minutes. Stop the game about halfway through when students are familiar with the game. Tell the students that now when they change stations, you want them to call out how their state of matter is changing:

For example:

If a student is at the river station and is sent to the ocean, he would say "I am water, a liquid, and I am staying a liquid."

If a student at the river station is moving to the clouds, she would say, "I am water, a liquid, and I am changing into water vapor, a gas."

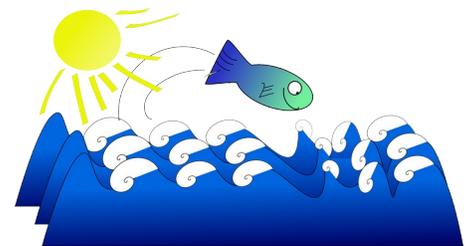
If a student at the clouds station is moving to the glacier, he would say, "I am water vapor, a gas, and I am changing into ice, a solid."

Start the game again, and move around the room to assist the students in identifying their changing states of matter.

You can stop the game again, and tell the students that now you want them to use the water cycle verbs to explain what is happening to them.

For example:

If a student is moving to the clouds, she would say, "I'm evaporating!"



If a student is moving from the clouds to the river, he would say, "I'm condensing and now I'm precipitating!"

If a student is moving from the plant to the clouds, she would say, "I'm transpiring!"

Start the game again, and move around the room to assist the students in identifying the water cycle verbs.

End the game after 20 to 30 minutes of play.

Bring the class back together and discuss what students observed during the game. Did they return to one station more than others? Were there any stations they did not visit? Did they get "stuck" at any station, rolling the die again and again? Ask students what states their water drops or molecules were in when they moved through the stations.

EVALUATION:

Students use their string of beads or their *My Journey Through the Water Cycle* tracking sheet to write (or draw) a story about their journey through the water cycle. Their story should include what state of matter they were at each station and how they changed when they went to the next station.



Give each student a different location such as a parking lot, stream, mountainside, or the human body, and ask them to identify ways water can move to and from that site. Have them identify the states of the water.

EXTENSIONS:

Have older students teach the Incredible Journey Water Cycle Game to younger students.

Ask students to compare the movement of water during different seasons and at different locations around the globe. They can adapt the game (change the faces of the die, add alternative stations, etc.) to represent these different conditions or locations.

Ask students to investigate ways water becomes polluted and is cleaned as it moves through the water cycle. For instance, it might pick up contaminants as it travels through the soil, which are then left behind as water evaporates at the surface.

New Jersey Learning Standards

Science: 2:ESS2.C 3:ESS2.D 4:ESS2.A, E 5: LS1.A, ESS2.A

English Language Arts: 2:W.2.3 3:W.3.3.A-D, W.3.4
4:W.4.3.A-E, W.4.4 5: W.5.3.A-E; W.5.4

Water Cycle Table

STATION	DIE SIDE LABELS	EXPLANATION
Soil	one side plant one side river	Water is absorbed by plant roots. The soil is saturated, so water runs off into a river.
	one side ground water two sides clouds	Water is pulled by gravity; it filters into the soil. Heat energy is added to the water, so the water evaporates and goes to the clouds
	one side stay	Water remains in the soil.
Plant	four sides clouds	Water leaves the plant through the process of transpiration.
	two sides stay	Water is used by the plant and stays in the cells.
River	one side lake	Water flows into a lake.
	one side ground water one side ocean	Water is pulled by gravity; it filters into the soil. Water flows into the ocean.
	one side animal one side clouds	An animal drinks water. Heat energy is added to the water, so the water evaporates and goes to the clouds.
Clouds	one side stay	Water remains in the current of the river.
	one side soil one side glacier	Water condenses and falls on soil. Water condenses and falls as snow onto a glacier.
	one side lake two sides ocean one side stay	Water condenses and falls into a lake. Water condenses and falls into the ocean. Water remains as a water droplet clinging to a dust particle.
Ocean	two sides clouds	Heat energy is added to the water, so the water evaporates and goes to the clouds.
	four sides stay	Water remains in the ocean.

Water Cycle Table *continued*

Lake	one side ground water one side animal one side river one side clouds two sides stay	Water is pulled by gravity; it filters into the soil. An animal drinks water, Water flows into a river. Heat energy is added to the water, so the water evaporates and goes to the clouds. Water remains within the lake.
Animal	two sides soil three sides clouds one side stay	Water is excreted through feces and urine. Water vapor is exhaled or evaporated from the body. Water is incorporated into the body.
Ground Water	one side river two sides lake three sides stay	Water filters into a river. Water filters into a lake. Water stays underground.
Glacier	one side ground water one side clouds one side river one side ocean two sides stay	Ice melts and water filters into the ground. Ice evaporates and water goes to the clouds Ice melts and water flows into a river. Ice melts and water flows into an ocean. Ice stays frozen in the glacier.

