Water Cycle in Your Bag

Duration : 15 to 30 min

Audience : 7 to 9 years

Create a small-scale water cycle

In a transparent bag, visualize evaporation, condensation and precipitation.

Abrinord
OBV de la rivière du Nord

Objectives

Understand the water cycle and recognize the different states of water

- *Identify the states of water in your daily life*

Required material:

- *Transparent resealable plastic bag (more than 15 cm x 15 cm) per student (e.g. Ziploc) **
- *Warm water*
- *Food grade dye*
- *Permanent marker*
- *Sturdy tape (must support the weight of the bag)*

** We suggest to wash and reuse the plastic bags from home and ask your students to do the same. However, they must be clean and free of any holes.*

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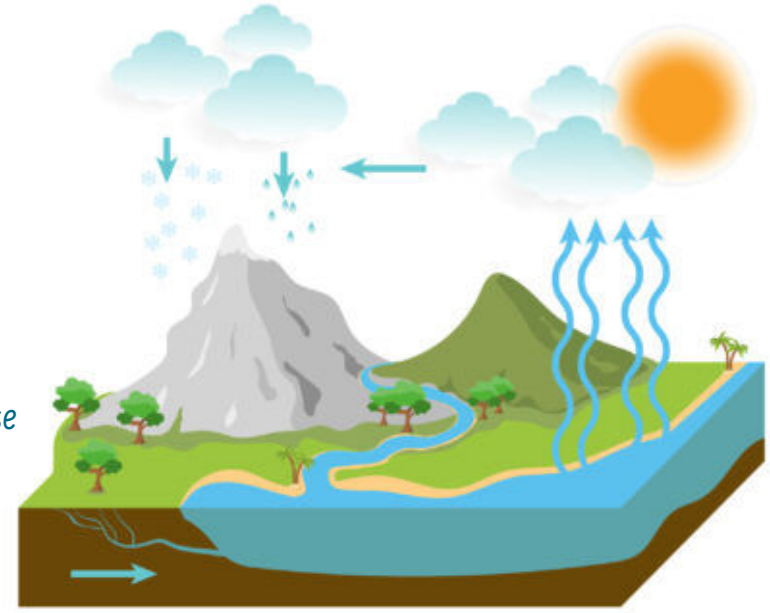
Course of the activity

Introduction (10 min)

Introduce the following basic concepts :

What is a water cycle?

The water cycle or hydrological cycle is the natural course of water in the environment. It involves several steps:



Evaporation : With the energy of the sun (heat), the liquid water in rivers, lakes and oceans heats up and evaporates as gas (water vapor).

Evapotranspiration : The liquid water contained in the soil, plants and animals can also evaporate, this is called evapotranspiration.

Condensation : Once evaporated, the water vapor rises to the sky and condenses into liquid water droplets to form clouds, since it is colder. Dew and frost are also forms of condensation at ground level. Frost, wich is the passage of water from a gaseous state (vapor) to a solid state (ice), is called solid condensation.

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Course of the activity

Introduction (10 min)

What is a water cycle ?

Precipitation : *When the water droplets in the clouds become too heavy, they fall as precipitation. Depending on whether it is hot or cold, precipitation is either liquid (rain) or solid (snow, hail). The precipitation that falls to the ground can then follow two paths:*

- Runoff : *When the soil is impermeable (e.g. asphalt, clay), water flows over it following the slopes of the land, until it reaches a water body or a stream.*
- Infiltration : *Water penetrates the soil when it is permeable (e.g. sand, soil). It will then reach groundwater.*

Groundwater circulation: *Through the process of groundwater circulation, water in the soil moves and joins surface water or a groundwater reserve, which is referred to as water table.*

Do you have examples of places where each of these phenomena can be observed?

- *Evaporation: mist on a lake or fog, the water level in the pool dropping in summer, steam over a hot drink or food*
- *Evapotranspiration: Sweat drops, breath when it's cold*
- *Condensation: Clouds, frost, dew, condensation on the windows or the mirror after the shower*
- *Precipitation: Snow, hail, rain, drops that bead up when you touch a foggy surface*
- *Runoff: Water flowing from the parking lot and street into the ditch or from the roofs into the gutters*
- *Infiltration: Water that seeps into the soil when watering plants or the garden, or after rain*
- *Groundwater circulation: Water from a well that feeds the house and wetlands*

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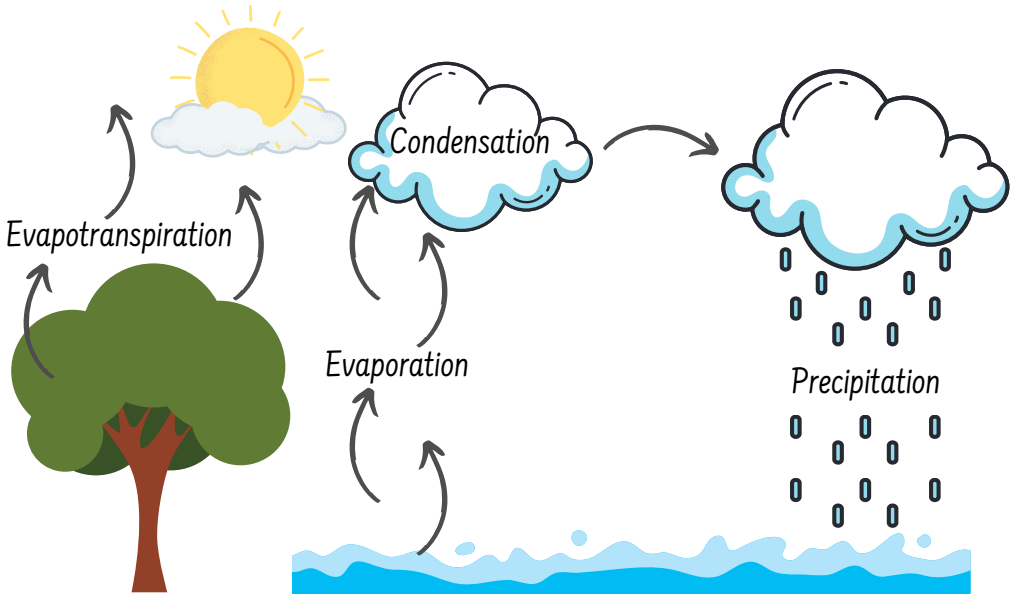
Course of the activity

Building the model (10 min)

1. Individually or in pairs, students write their names on the top of the bag, then draw elements of the water cycle on one side of the bag (the side without a label) to represent the following diagram.



2. Add one or two drops of blue dye to each bag, then fill the bags with about 2 cm of warm water to promote evaporation.
3. Close the bags tightly and tape them onto the windows in the sun with the designs facing inward.
4. After a while, the water in the bag will begin to evaporate, then condense on the walls of the bag and finally precipitate as drops on the walls. You can now observe the water cycle and continue with the Reflection section.

*This step may take some time, as the water must evaporate.

In the long run, the cycle will be continuous in the bag in the summer. In the winter, you will see condensation and precipitation between the bag and the window.

After the activity, students can leave with their model or you can collect the bags, clean them with acetone or hairspray and reuse them to repeat the activity with a new group

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Reflexion

Where does drinking water come from?

- *Drinking water may come from a groundwater source, from water that has seeped into the ground, or from a surface source, from water that has run off into a stream or water body*

How can there be precipitation in winter (snow) if it is not warm enough for evaporation to occur?

- *The clouds come from warmer places, like the United States, and move here due to wind.*

If there was less water infiltration due to soil sealing, how will this impact the water cycle?

- *If water no longer infiltrates, there will be more water available for evaporation, thus more condensation and more precipitation.*
- *There will be more runoff and more risk of flooding, as most of the water will go into lakes and rivers.*
- *There will be less groundwater recharge and potentially more drinking water supply problems.*

What will happen if it gets warmer on the planet?

- *If it is warmer, there will be more evaporation and therefore more condensation and more precipitation in some places, while other places will be drier.*

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