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# TEACHER GUIDE

## WATER CYCLE
## GRADES 3-5

## COMMON MISCONCEPTIONS

- **Students may believe that water is gone when it evaporates.**
  There is a finite amount of water on the earth; water is not being created on Earth, and doesn't leave the earth.

- **Students may think that new water is created during rain and snow events.**
  New water is not created on the earth; water is recycled through the processes of the water cycle. The water that falls as precipitation was water vapor contained in clouds, and before that, possibly liquid water in oceans or rivers.

- **Students may not know the difference between water vapor and air.**
  Water vapor consists of water in gas form suspended in air. Air itself is composed of a number of gases, primarily nitrogen but also oxygen, argon, carbon dioxide, and a variable amount of water vapor.

- **Students may believe that water only evaporates from bodies of water, and that water only disappears on land by sinking into the earth, not through evaporation.**
  Water evaporates from the liquid form wherever it is found on the earth. Whether water is absorbed into the land or evaporates - or both - depends on current weather and soil conditions.

## WATER CYCLE

The water cycle, also known as the hydrologic cycle, is the continual movement of water through its three forms of solid, liquid, and gas. The processes that cause water to change form are evaporation and condensation, which take place in, on, and above the Earth. The water cycle is driven by heat from the sun. Water molecules continually change from liquid and/or solid water to water vapor through evaporation, and back to liquid and/or solid water through condensation, as shown by the demonstrations in the video.

## EVAPORATION

Evaporation is the process of water molecules changing from a liquid state to a gas state known as water vapor. The process is driven by warming temperatures, primarily caused by the sun. Sublimation is a form of evaporation where

water changes from a solid to a gas without becoming liquid first. The change to water vapor occurs when the bonds between liquid or solid water molecules break due to energy applied in the form of heat. Evaporation from large water surfaces, such oceans and large lakes, are the major drivers of the water cycle on a planet-wide scale.

## CONDENSATION

Condensation is the opposite of evaporation. Condensation occurs when gas molecules of water vapor join up, or coalesce, causing the state of the gas molecules to change to liquid or solid forms. The water molecules come closer, or condense, when water vapor encounters colder temperatures, as in the upper levels of the atmosphere. Water vapor rises into the atmosphere where it condenses into clouds. Condensation often needs a particle, or nucleus, such as dirt, smoke, or salt to coalesce around. When water molecules coalesce, they change from random orientations in water vapor to more structured patterns in raindrops and snowflakes.

## PRECIPITATION

Precipitation occurs when condensed water vapor in the atmosphere forms water droplets that are large enough and heavy enough to be affected by Earth's gravity, which causes them to fall toward the ground. Water droplets fall out of the atmosphere as precipitation, which can take a number of forms such as rain, snow, hail, and sleet.

## DISTILLATION

Distillation is a process where a liquid—in the video it's water—is heated until it turns into a vapor and then cooled so that it condenses back into a liquid. In distillation the process takes place in a controlled situation or apparatus where typically the condensed liquid is collected. The distillation process can purify or refine the liquid being distilled because in general, particles in the liquid do not evaporate and so are left behind. The DIY activity that Izzy demonstrates in the video is a distillation process.

## EVAPOTRANSPIRATION

Evapotranspiration is the process of leaves releasing water and oxygen during photosynthesis, a source of approximately 10% of the water in the hydrologic cycle of Earth.