Cloud in a Jar

Suggested Age / Grade Level	Curriculum Covered	Duration
Grade 3 - 8 (8 - 13 years old)	- Rain - Water Cycle - Other forms of precipitation	1 hour

Overview

Campers will be introduced to rain and other types of precipitation. They will also be introduced to the water cycle and the details of its four phases while applying their knowledge of phase transitions specifically vapourization and condensation. Campers will then review and see what they've learned by completing the accompanying worksheet and by creating their own simplified model of a rain cloud

Learning goals

- Apply knowledge of phase transitions (specifically vapourization and condensation)
- Understand the phases of Earth's endless water cycle
- Understand what rain is and its role in the water Cycle
- Introduce different categories of precipitations and how they differ from each other

Materials

- Blue food coloring
- Shaving cream
- A clean jar (alternative: clean glass)
- Water
- Dropper
- Separate bowl for mixing

Instructions for Cloud in a Jar

1. In a separate bowl mix together 2 teaspoons of blue food coloring and 1 tablespoon of water
2. Fill jar with water, about 95% full
3. Add shaving cream on top of the water to create a fluffy cloud. Wait 2-3 minutes to let the shaving cream settle
4. Suck up some of the blue food coloring-water mixture with your dropper or mini pipettes and drop it onto the shaving cream. Repeat about 6-7 times.
5. Now wait and observe

Notes: If it's taking a while for the blue food coloring to fall into the jar of water, keep adding more drops of the blue food coloring-water mixture

Key Terms

Rain: droplets of liquid water that have condensed together to form clouds
Water Cycle (can also be called **Rain Cycle**)**:** describes the endless movement of water on Earth
Dew point: temperature at which cloud can form
Precipitation: any product that was condensed by atmospheric water vapour and falls to the ground due to gravity
Acid rain: precipitation that contains acidic components caused by atmospheric pollution

Lesson Summary

- When condensed droplets of water accumulates, the cloud get heavier and heavier and eventually will release these droplets because of gravity
- Rain is a major component in the water cycle and provides the Earth's supply of fresh water
- Rain is important for the survival of ecosystems and hydroelectric plants, and the growth of plants and vegetation
- Water on Earth moves between bodies of water (oceans, lakes, rivers), the atmosphere and land
- There are 4 phases of the water cycle

1. **Evaporation** - the sun heats up the surface of the Earth causing the bodies of water on Earth to also heat up. When this happens, some of the water evaporates into the air, turning into vapour.
2. **Condensation** - as water evaporates into the sky, it's temperature decreases and turns into a liquid, forming clouds. Cloud form at dew point, depending on moisture and humidity

3. **Precipitation** - When too much water has condensed, the droplets in the cloud become too heavy for the air to hold. Due to gravity, these droplets fall back to Earth. The rain we see falling to the ground is precipitation.
4. **Collection** - the precipitation that has fallen is collected in bodies of water like rivers, lakes and oceans where it will eventually evaporate back into the air, beginning the cycle all over again.
    - Some directly fall into lakes, rivers and the ocean
    - If it falls onto vegetation it might evaporate from leaves back into the air or trickle to the ground and be taken up by the roots

- The type of precipitation we see is classified based on their behaviour from the sky to the ground
- When rain makes its way down, the temperature of the atmosphere isn't cold enough to freeze it therefore it remains a liquid droplet
- Hail forms when very cold water droplets touch dust or dirt; temperature of the ground doesn't matter. Once it hits the ground it remains a solid
- Snow is formed similarly to hail. Due to temperature and humidity of the air, snowflakes develop a pattern in their structures which is not seen in hail.
- Snow requires the ground to be less than 0°C or else it will melt once it hits the ground
- Not all precipitation from clouds are fresh; sometimes precipitation may contain acidic components like sulfuric acid or nitric acid because of atmospheric pollution
- Main cause of atmospheric pollution is the industrial burning of fossil fuels.
- Acid rain can harm the environment of forests and lakes. Acid rain does not directly harm humans but its acidic components can damage human health.