



Teachers Guide For: **Second Grade Program: Weather and the Atmosphere**

Includes the full dome show: **The Water Cycle**

OBJECTIVES:

- Understanding that weather is whatever is occurring in the lower atmosphere at any given time.
- Understanding that most of the Earth's atmosphere is located closer to the surface than is apparent.
- The water cycle is a process that drives our weather.

This program primarily targets VA. Science standards: Interrelationships in Earth/Space Systems 2.6, The student will investigate and understand basic types, changes, and patterns of weather but includes others topics as well.

Program Description:

Students are asked to observe and describe current weather conditions outside the planetarium then, once inside are asked to suggest other types of weather, not currently happening, but possible. The discussion leads to the question "What is weather? How can weather be defined in a simple but all-inclusive way?" The answer: "Whatever is happening in the atmosphere at any given time" leads to a PowerPoint "expedition" first to the top of the atmosphere, where students learn that most of the atmosphere is less than twenty miles above the surface. Here, the opportunity is taken to emphasize how little air actually surrounds the Earth, leading to a better understanding of why human activities can and do have a negative impact on the atmosphere and the climate. The processes of the water cycle, the "engine that drives our weather" are humorously depicted to the students by imagining themselves reduced to the size of microscopic water droplets inside of a cloud where condensation is witnessed. This leads to the presentation of the full dome immersive video, The Water Cycle.

The Water Cycle (14 min) The audience is introduced to water, a substance essential to all life that has been present nearly as long as the Earth. Water is a substance that can exist in all three physical states of matter through a narrow temperature range that easily accommodates the stages of the water cycle, the process that is the basis for weather.

Post full dome video live segment.

Following the video, we transition to the simulated daytime sky projected on the dome and seek to identify and review the previously discussed “ingredients” of weather visible on the dome (water, air, and solar energy). From there, time permitting, the atmosphere is “removed” turning the daytime sky black with the Sun still in the sky, and the stars and planets now visible as well. Venus, the most Earth like planet in size is pointed out and magnified while the audience is asked to reflect upon what weather might be like on another planet. Conditions and characteristics of Venus’ atmosphere is discussed as we speculate how different Venus’ weather would be from Earth’s.

Before Your Planetarium Visit:

Vocabulary words to be familiar with.

evaporation, condensation, transpiration, precipitation, runoff, atmosphere, temperature, wind, air pressure, humidity, solid, liquid, gas, water, water vapor, ice, sunlight, clouds, thunder storm, tornado, hurricane, blizzard.

A Demonstration of Condensation:

If a warm, humid day is occurring outside have students fill a dry glass with ice water. Take the glass outside and set it down on a flat surface. With a paper towel dry the surface of the glass to remove any residual water droplets occurring when filling the glass. Observe the glass after a minute or two and note any changes to the surface of the glass. Ask the students to suggest what has happened to the glass that resulted in the surface now covered with water droplets.

This experiment can also be accomplished indoors in a bathroom by first running hot shower water for a few minutes with the door closed to create an indoor humid environment, then proceed as above.

After Your Planetarium Visit:

- During the show, students learned that the atmosphere is heavier and denser close to the ground and becomes less dense as you go up. Have students locate a building (a public building, or friend or relative's apartment building with at least ten floors. Have the students ride up and down the elevator and notice the changes they feel inside their ears, the result of lower air pressure the higher you go. The density of air can be experienced within 100 feet above of the surface. If they have a household barometer, try watching the indicator needle move while riding up and down. Where else do you feel air pressure changes in your ear. (in an airplane cabin)
- Weather events can be very destructive. Earthquakes and tsunamis can be extremely destructive too but are they related to weather? Why not?

Useful Resources:

- APS Science Unit Planner: SOL 2.6 The student will investigate and understand basic types, changes and patterns of weather: [https://www.apsva.us/wp-content/uploads/legacy_assets/www/72505b724a-2.6 Interrelationships.pdf](https://www.apsva.us/wp-content/uploads/legacy_assets/www/72505b724a-2.6%20Interrelationships.pdf)
- As weather occurs in the atmosphere some very lovely and fascinating optical effects can result. Rainbows are of course the most widely known and romanticized but other fascinating effects can be witnessed as well. Students can visit the Atmospheric Optics web page at www.atoptics.co.uk to learn the names and causes of numerous other atmospheric phenomena caused by sunlight, water, ice and other things in the atmosphere.
- A NASA cloud identification chart in English: https://science-edu.larc.nasa.gov/cloud_chart/
- A NASA cloud chart in Spanish: https://science-edu.larc.nasa.gov/cloud_chart/PDFs/Cloudchart_ESP.pdf
- While weather occurs primarily in the lower atmosphere, there are other forms of weather that happen much higher up in the rarified upper atmosphere, near the edge of space and beyond. www.spaceweather.com , highlights these occurrences, with explanations and user provided images of sky phenomena seen from around the world.