



WOW Program Lesson Plan

Making a Sunset

Program Duration:

10 minutes

Recommended Grade**Levels:**

K-5th grade

Materials Needed:

- 500-1000 mL beaker (or any clear cylinder shaped container or tall glass, just make sure it is see-through)

-Water

-Two white pieces of paper

-Optional: clipboard to hold up the paper, very beneficial

-Skim milk (50 mL)

-Half and Half

-Very bright flashlight or incandescent spot lamp (this represents the sun)

-Measuring cups with mL

Ohio Learning Standards Met

K- Properties of Everyday Objects and Materials, Physical and Behavioral Traits of Living Things, 1- Sun, Energy, and Weather, 2-The Atmosphere, 3-Earth's Resources, Matter and Forms of Energy, 4-Electricity, Heat, and Matter, 5- Light, Sound, and Motion

Learning Objectives

1. Students will be able to understand why and how sunsets happen.
2. Students will be able to understand how light and particles react together in the sky.

Preparation

- Discuss with your child why they think the sky is blue.
- Ask them what they think a sunset is.
- Ask them why they think the sunset has different colors.

Background

Most people look in the sky and ask why it is blue. They also tend to wonder why sunsets can appear to be different colors. This is because there are gas molecules and other particles in our air that when looking through them, the light passing through appears to have a color. The color is caused by scattered light waves from the sun hitting the particles in the air. During this experiment, you will see how particles can distort light and create colors that are visible to the eye.

Activity

1. After explaining to your child what causes a sunset, it is time to create one!
2. First, fill your container halfway with water. Then, shine your light source through the clear container. The container should be in front of a blank white surface (the paper on the clipboard). The color of the flashlight should shine through – this light acts like the sun.
3. Next, with the light still shining through the container, add 6mL of skim milk and stir. The water should appear to have a bluish tint. The paper on the other side should appear to have a yellowish color. This is due to the milk particles reflecting the light waves as yellow.

4. Continue to add ~3mL of milk to demonstrate the sun setting. Continue until only a reddish color appears on the white paper. You just created a sunset!
5. Now pour out the milky water and add new fresh water. Have kids notice that you can see the light shining through the water without anything in the glass/beaker.
6. Next add 10mL of half and half to the water and do not mix it. The half and half will look like white clouds.
7. Now mix it together. Can light be seen behind the beaker/glass? No! The color is blocked. It is because the particles are so big that they just block out the light and not scatter it. This is why you cannot see the sun on a cloudy day. The UV light is still there, but the sunlight is blocked.

Questions

1. What color(s) do you see when the light is placed directly above the glass?
2. What color(s) do you see when the light is shown through the side of the glass?
3. What other colors do you see in the sky sometimes?

Summary

Our atmosphere is made up of an incomprehensible number of tiny gas molecules, each of which is not that much different in size than a wavelength of light. These gas molecules are transparent over short distances, but if you look through enough of them, they are not transparent anymore! (The same is true of water. Shallow water looks perfectly clear, but when water gets deep enough, it appears blue, because there is enough of it to preferentially scatter blue light to the point that we can actually see it happening)

Looking through a thin piece of atmosphere, such as when the sun is high in the sky, means that there is much less atmosphere for the light to go through to reach you, and there is less distance to get scattered in. The result is a deep blue sky and a yellow-white sun. As the sun gets lower in the sky, the blue of the sky begins to change slightly in color; the sunlight turns more yellowish, until at sunset the sunlight is orange or red, and the sky is all the colors scattered out of the sunlight. Sometimes the sunset is much more brilliant than other times. This is because there are dust particles in the air as well! After a volcanic eruption, a major forest fire, during very dry windy weather, or in a very polluted area, there are lots more dust particles in the air, and the dust now enhances the scattering of light.

Although these billions of tiny particles of dust are in the atmosphere and are too small to see, they scatter light very well. Scattering means that when light hits these particles, the light bounces off them and goes another direction. Blue and violet light scatters the most and orange and red scatter the least. At sunset and sunrise when the sun is low in the sky, the sun's rays travel through a thicker portion of the atmosphere than at midday, so they run into more particles in the atmosphere and the light is scattered.

Shining the light through the water mimics how we see the midday sun. When we add milk to the water and shine the light through, only orange and red light rays pass through the water that was clouded with extra particles. The milky water stops some colors in the light from getting through, just as the thick atmosphere does when the sun is low in the sky.

Extended Exploration

1. Is the sky blue on other planets? Learn more about the activity we did above (with helpful diagrams) along with learn about the sky color on other planets at <https://spaceplace.nasa.gov/blue-sky/en/>
2. There is a natural light display in the sky called an aurora. We have them at the poles (Aurora Borealis and Aurora Australis). It is caused by magnetic disturbances by the winds. Energy is released in the form of colors. You can create this at home using milk, food coloring, and dish soap. The following link will show you all the steps, and more fun activities: <https://itteacheronthetrail.com/2015/10/06/the-northern-lights-in-a-bowl/>