

## TEACHER GUIDE FOR THE PERFORMANCE OF

### **CLIMATE, LET'S DEFINE IT!**

#### **ABOUT THE PROGRAM**

Billy B. blends zany humor and solid science for a captivating and unforgettable exploration of what the climate is and why it is changing. This is a fun and factual show. Billy B presents the patterns in nature that we depend upon; daytime-nighttime, seasons, as he explores our atmosphere; it's composition and how we affect it. With catchy lyrics and energetic dances he creates images, images that the children can remember and repeat on their own, of the dynamics of climate and how we can positively affect it (planting trees). He plants a seed in a child's mind of how to approach this important subject with an optimism based on scientific fact.

#### **Learning Goals**

To define the importance of natural cycles in our daily lives

To provide a basis for understanding how weather is created

To provide a basis for understanding what the atmosphere is and how it works

To present ideas for positive, effective, action to face the challenge of a warming climate

#### **Background Information for Students**

Often you hear about "Climate Change" on news reports. What is climate and why would a changing climate matter?

Our human society depends upon predictable weather, like receiving the rains of spring for planting seeds, or the receiving the right amount of heat in summer so the seeds can grow into fruit, vegetables and grain, and the knowing the right time to harvest our foods. We depend upon the patterns of weather so we can plan, ahead of time, what to do, and when to do it. So we keep track of the day to day weather. We keep records of it. We have been doing this for a long time. And when we study old trees (tree rings), or ice deep in a glacier (annual ice creation), or mud on the bottom of old lakes or the ocean (annual deposits), we can tell a lot about the weather patterns from long, long ago.

## **Background Information for Students ( cont. )**

The pattern of weather, over time, is called Climate. Keeping weather records for 30 years in one area can define, tell you, what the climate is for that area. So when the weather starts doing things it hasn't done before, and it keeps doing those things, you say, "the weather pattern is changing, the Climate is changing".

Our earth is a ball, a sphere. Because of its roundness, the strength of the sunshine is different everywhere on earth. This uneven heating creates movement in the air and the water vapor. This creates our changing weather.

The air is a very thin layer of gases which gravity holds to the Earth. Mostly it's just two gases; 78 percent (%) Nitrogen, 21% Oxygen. The last 1% (78 plus 21 = 99) is mostly a gas called Argon, .93% ( that's point 93%, meaning less than 1). And a little bit of that last 1%, .04 of it, is Carbon Dioxide, which is sometimes shortened and called, CO<sub>2</sub> (one carbon atom-C-, and two oxygen atoms-O<sub>2</sub>). We call this thin layer of gases the Atmosphere. And that little little bit of CO<sub>2</sub> gas is what keeps our atmosphere warm. That's what CO<sub>2</sub> does, it absorbs and re-releases heat.

When you breathe in, you breathe in all these gases, but your body only uses the oxygen, just some of it. When you exhale, it's mostly Nitrogen, then Oxygen, then water vapor and then CO<sub>2</sub>. But a lot more CO<sub>2</sub> comes out of you than goes into you. Your body creates and wants to get rid of CO<sub>2</sub>. But it all works out because plants want to get rid of Oxygen and they want to take in CO<sub>2</sub>. It's a good trade; they breathe in our bad breath and we breathe in theirs.

We create Electricity mostly by boiling water. The boiled water turns to steam which will then force turbines to spin and that creates electricity. To boil the water we burn coal, oil, and gas. When we burn these things to make electricity we release CO<sub>2</sub> into the atmosphere. When we use a car that uses gasoline we also release CO<sub>2</sub> into the atmosphere. The ocean and the rocks absorb more than half of that CO<sub>2</sub>. But a lot of what we release (40%) mixes with the CO<sub>2</sub> already in the atmosphere. And CO<sub>2</sub> absorbs the sun's heat, and the heat coming off of the earth, and releases it back into the atmosphere. This creates warmer weather, and warmer oceans. That is why the climate is changing now.

What can you do to absorb CO<sub>2</sub>, to take it out of the atmosphere? Plant a tree! Walk or ride a bike to school. Once you start thinking about CO<sub>2</sub> there's all sorts of things you can do!

## **BEFORE THE PROGRAM**

1. Ask your class what they have heard about “Climate Change”, “Global Warming”. Introduce the definition of Climate as the pattern of weather in one area over many years.
2. Locate the equator on the globe. Then locate your town with respect to the equator. Where would the sun appear from your perspective in the sky (given your latitude) in the summer? In the winter? What if we lived on the equator? Using a globe and a ball for the sun, see if you can replicate the earth and sun's relative positions during the seasons. Describe how the earth spins on its axis, revolves around the sun, and does so at an angle, causing the seasons. Have the students note the difference of the sun's location if living at the equator versus living at successively higher latitudes. Then go outdoors on a sunny day at noon and plot the students' shadows. Repeat this at different seasons of the year. Note the differences. Where would their shadows be if they lived on the equator? How does this affect climate?
3. Ask the students what is different from being on the earth and being in outer space? Point out that the major difference is there is no air in outer space, air that let's us breathe, air that keeps us warm, air that carries sound to our ears.

## **AFTER THE PROGRAM**

1. Discuss the climate in your area. Talk about the differences between your climate and the climate at the equator, or the climate in the desert. Ask what kind of clothes would be best for each climate. Talk about the difference between the climate and one day of weather. Point out that it takes thousands of days of weather to define a climate.
2. Review how plants take in CO<sub>2</sub> and release (from the water molecule) oxygen.
3. Ask the students what they could do to cut down on how much CO<sub>2</sub> they put into the atmosphere.

## VOCABULARY

1. **Climate** – Climate is the average measurements of temperature, wind, humidity, snow and rain in a place over the course of years. Climate is like weather, but over a long time.
2. **Absorb**: to take in ( something, such as a liquid) in a natural or gradual way
3. **Weather** – The state of the air and atmosphere at a particular time and place: the temperature and other outside conditions (such as rain, cloudiness, etc.) at a particular time and place
4. **Atmosphere** - the whole mass of air that surrounds the Earth, a mass of gases that surround a planet or star
5. **Gravity** - the natural force that tends to cause physical things to move towards each other : the force that causes things to fall towards the Earth
6. **Nitrogen** - a chemical that has no color or smell and that makes up a large part of the atmosphere
7. **Oxygen** a chemical that is found in the air, that has no color, taste, or smell, and that is necessary for life
8. **Carbon Dioxide** - a gas that is produced when people and animals breathe out or when certain fuels are burned and that is used by plants for energy
9. **Green House** - a building or part of a building that has glass walls and a glass roof and that is used for growing plants. Relating to or caused by the warming of the Earth's atmosphere that is caused by air pollution : relating to or caused by the greenhouse effect, *greenhouse* warming, carbon dioxide and other greenhouse gases (=gases that cause the greenhouse effect)
10. **Water Cycle** –
  - A. **Evaporation**: Heat from the Sun causes water on Earth (in oceans, lakes etc) to evaporate (turn from liquid into gas) and rise into the sky. This water vapor collects in the sky in the form of [clouds](#).
  - B. **Condensation**: As water vapor in the clouds cools down it becomes water again, this process is called condensation
  - C. **Precipitation**: Water falls from the sky in the form of rain, snow, hail, or sleet, this process is called precipitation.
  - D. **Collection**: Oceans and lakes collect water that has fallen. Water evaporates into the sky again and the cycle continues.
  - E. **Transpiration**: In a process similar to sweating, plants lose water which is absorbed into the atmosphere much like evaporation. The combination of evaporation and transpiration is known as evapotranspiration.