

Global Warming
Emerging Science and Understanding
globalwarmingclassroom.info

DVD Lesson 1: Lesson Plan

Purpose:

*****To establish a base of knowledge in order to better process and understand the content of Lesson 1 of the DVD "Global Warming; Emerging Science and Understanding.*****

Lesson 1 Goals:

1. Students know the different atmospheric gases that absorb the Earth's thermal radiation and the mechanism and significance of the greenhouse effect.
2. The students will learn how the earth's temperature is highly variable and that it has been stable or declining in recent years while carbon dioxide continues to increase.
3. The student's will learn that temperature *precedes* change's in carbon dioxide, not the other way around as previously thought.
4. The students will learn that when all of the emerging science is considered, man-caused global warming is not a forgone conclusion agreed upon by all scientists. There is great debate within the scientific community.

Preparatory Activities

(To be done prior to viewing Lesson 1 on the DVD)

Required Materials:

Introductory Material Sheet
Computer
Graph paper

Activity 1: Elicit prior knowledge:

Put the following questions on separate sheets of chart paper. Divide the class into groups. Have students write their answers on the paper. Rotate groups every few minutes. Revisit these questions at the end of the unit to see if perceptions have changed.

Discussion Questions: 1. What is global warming? 2. What causes it? 3. Where have you heard about global warming? 4. What is a carbon foot print? 5. What are some buzz phrases that you hear regarding the environment? 6. What are greenhouse gasses? 7. What does CO₂ do for the environment?

Activity 2: Understanding the vocabulary: familiarize students with the terminology and vocabulary to which they will be exposed in viewing the Video Lessons.

Ideas for learning the vocabulary: Consider posting these words, or having the students make a bulletin board with the words and their meanings. Younger students could play a Jeopardy style game to learn the terminology. Quizzing could be used for older students. Openly discuss the meanings of the vocabulary and terminology so to ensure student's understanding.

Vocabulary Words:¹

Proponent- n.	One who argues in support of something; an advocate.
Amplify-v.	1. to make larger, greater, or stronger; enlarge; extend. 2. to expand in stating or describing, as by details or illustrations; clarify by expanding
Reputed-adj.	Reported to be true or supposed to be such
Precede-v.	To go before, as in place, order, rank, importance, or time.
Effusing-v.	To pour out or forth; shed; disseminate
Amplify-v.	To make larger, greater, or stronger; enlarge; extend.
Variable-adj.	likely or liable to vary or change; changeable: variable weather; variable moods.
Audit-n.	1. An examination of records or financial accounts to check their accuracy. 2. An adjustment or correction of accounts. 3. An examined and verified account.
Emissions-n.	A substance discharged into the air, especially by an internal combustion engine.
Precipitation-n.	The amount of rain, snow, hail, etc., that has fallen at a given place within a given period, usually expressed in inches or centimeters of water.
Corrupted-v.	containing errors or alterations

Lesson Terminology (These words can be found on the Introductory Sheet)

Paleoclimatic Data:

Measurements resulting from the study of climate before instrumental weather records by analyzing layers in ocean and lake sediments, cave deposits, tree rings, ice cores, and microfossils.

Student Link:

http://www.drought.gov/portal/server.pt?open=512&objID=228&mode=2&in_hi_userid=2&cached=true

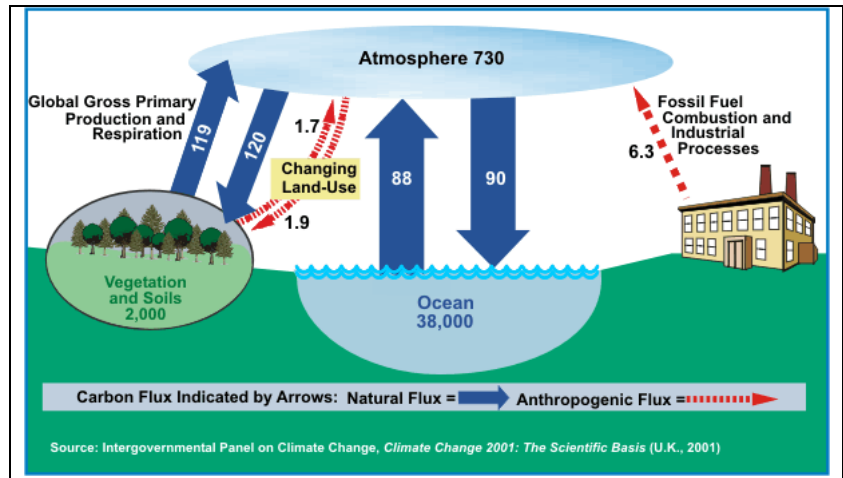
IPCC- Intergovernmental Panel on Climate Change

A political panel within the United Nations designed to study the causes of global warming and recommend world policies to reduce human impact on global warming.

¹ *The American Heritage® New Dictionary of Cultural Literacy, Third Edition.* Houghton Mifflin Company, 2005. 05 Nov. 2008. <Dictionary.com <http://dictionary.reference.com/browse>

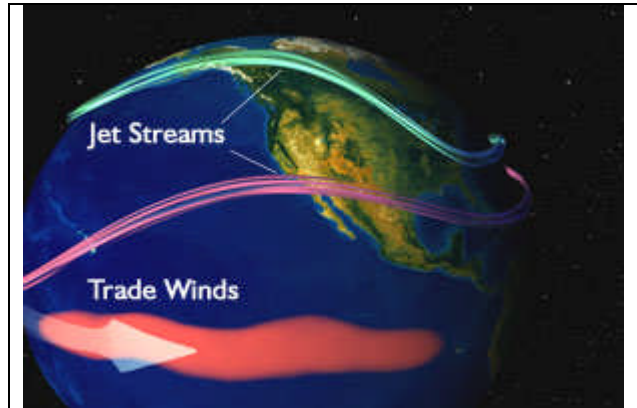
CO₂-Carbon Dioxide

Large amounts of carbon dioxide is released into the atmosphere from decaying vegetation, oceans, volcanoes, hot springs, and geysers. A smaller amount is released into the atmosphere by burning fossil fuels (coal, petroleum, natural gas) and vegetable matter. Less than 2 percent of all CO₂ is in the atmosphere and over 93 percent is in the oceans. CO₂ is used by plants for photosynthesis. It is required for plant growth and development. Increased CO₂ levels have been shown to increase crop production and make farming in poor conditions, such as desert areas and areas with poor soils. When more CO₂ is released than returns to these sources, a buildup of CO₂ occurs in the atmosphere.



El Nino

A change in the Pacific Ocean's surface temperature by a few degrees Celsius when wind pushes warm water from the western Pacific to the eastern Pacific Ocean. These changes cause atmospheric conditions often resulting in rain, thunderstorms or drought around the world. When the wind no longer pushes the warm water east, cool water returns and is called La Nina. A corresponding, but less pronounced cycle occurs in the Atlantic Ocean.



Student Links:

See a NASA visualization: http://www.globalwarmingclassroom.info/el_nino.htm
<http://meteora.ucsd.edu/~pierce/elnino/whatis.html>
<http://www.pmel.noaa.gov/tao/elnino/el-nino-story.html>

Global Warming

Global warming is a term that has been used to describe a period in recent history when the earth's surface temperature warmed. There have been three periods of global warming since 1850; from 1860 to 1880, 1915 to 1945, 1975 to 1998 (see graph). The most recent warming was originally thought to be caused by the emissions by man of carbon dioxide, commonly called by its scientific name CO₂. Each period of warming

was separated by a period of global cooling. The warming/cooling cycles, and their associated change in precipitation patterns are called climate change. Climate change has been occurring for the past 11,000 years since the last ice age.

Greenhouse Gases

Greenhouse gases are those gases that allow most solar radiation (mainly visible light) to penetrate to the earth's surface, but absorb thermal infrared radiation emitted by the earth's surface. As solar energy reaches the earth's surface some of it is reflected back out into space, some is absorbed by the atmosphere, and the rest is absorbed by the earth and warms it. The warm earth then emits infrared radiation which we cannot see. Most of this infrared radiation is absorbed by the various greenhouse gases, much of which is emitted back down to the surface of the earth where it starts the cycle again. This cycle is called the **greenhouse effect** because it acts somewhat like a greenhouse in that it allows the sunlight to penetrate the greenhouse, but as the greenhouse warms, the glass ceiling and walls prevent most of the heat from escaping.

NGO- Non-governmental Organization

A nonprofit group or association like the Sierra Club or Nature Conservancy organized outside of institutionalized political structures to realize particular social objectives (such as conserving nature) or serve particular constituencies (such as local communities).

Activity 3: Learning the effects of water vapor as a greenhouse gas.

In the activity that follows students will understand that water vapor is a major greenhouse gas and the effect that it has on the environment as well as learning emerging understanding about the historic carbon dioxide/temperature relationship and the changing understanding resulting from corrections of previous errors.

Review the introductory material with the class. To take a closer look at the impact of water vapor's impact as a greenhouse gas, choose two towns that have a difference in humidity levels such as [New Orleans and Las Vegas](#).

Some cities are not recommended as elevated temperatures are created due to asphalt roofs and roads. **This is called the heat island effect.** Choose dates that the class will use for their search.

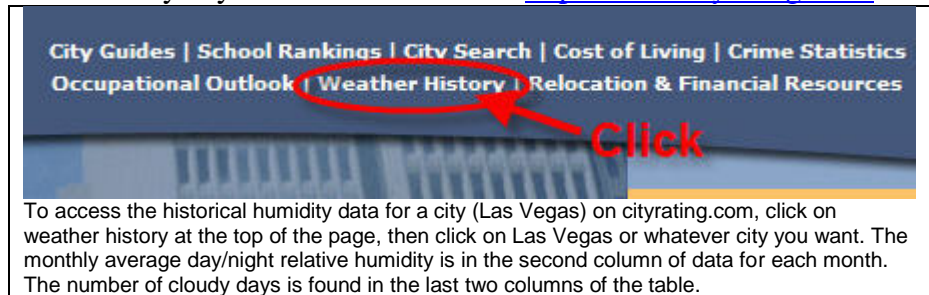
Using the following website, <http://www.accuweather.com/> compare the differences between day/night temperatures in humid and dry areas. This day/night temperature range is called the **diurnal temperature range**. Divide the class into groups. Have half of the groups look up the day/night temperatures in several cities. Assign Las Vegas, NV and New Orleans, LA to



To access the historical temperature data for a city (Las Vegas) on accuweather.com: 1) type in Las Vegas, NV; 2) Hover over "Forecast"; 3) then "Historical Weather"; 4) and finally click "Typical Weather".

at least one group. Another pair could be Phoenix, AZ and Miami, FL. Other groups can look other cities. Remember, cities like Phoenix, AZ are artificially more humid because of agriculture and irrigation. The remaining groups will look up monthly day/night **diurnal humidity ranges** and number of sunny days for the same cities at <http://www.cityrating.com/>.

Each group needs to record the high and low temperature, and/or high and low humidity levels for each month, as assigned for their city.



The blank forms the students can use can be found [here](#). Compare the latitude for the paired cities as well. Las Vegas, for instance is much further north and 2000 feet higher in altitude than New Orleans, yet Las Vegas’ summer maximum temperatures are hotter because it is so dry. At the same time its low temperatures for the summer months are about the same as New Orleans. This makes the **diurnal** temperature range much greater for Las Vegas than New Orleans, which, in turn makes the “Normal Average” for Las Vegas warmer than New Orleans in the summer. Yet, because of the humidity, New Orleans “feels” hotter.

			June		July		August	
			Temp/hum	Difference	Temp/hum	Difference	Temp/hum	Difference
Las Vegas	Temperature	Hi	99	25	104	27	102	24
		Low	74		78		78	
	Relative Humidity	Hi	24	13	28	13	34	17
		Low	11		15		17	
Number cloudy days			8		10		10	
New Orleans	Temperature	Hi	90	18	91	17	91	17
		Low	72		74		74	
	Relative Humidity	Hi	90	26	91	24	91	24
		Low	64		67		67	
Number cloudy days			22		27		24	

Note: If the temperature data from the two websites are compared, they will be slightly different. If a student asks about it, the reason is because the data is collected at different places in the city; i.e. the airport vs. city hall. Also, the relative humidity and cloudiness in Las Vegas increases through the summer because more Gulf of Mexico humidity and moisture begins to move into the Southwestern US in July and August, along with more afternoon/evening thunderstorms. This is more pronounced in Arizona and New Mexico desert cities.

Compare the differences in day/night temperature, relative humidity and cloudy days between the humid city and the arid city. What conclusions does the class make? Does humid **air with more water vapor** retain more heat than arid **air**? What effect does this greenhouse gas have on the environment?

Activity 4: To familiarize students with the graphs that will be used in the Video Lesson.

Download and review the graphs with students so they will understand what they are seeing when they see them in the video. Attention should be given to the timelines on the graphs that

refer to time periods so that students will understand how much time is being covered by any given data. Or, if your classroom is equipped with internet access, the graphs can be viewed at the globalwarmingclassroom.info website.

****View Video Lesson 1****

Review Graphs:

Review any of the graphs or photos used in the video to explain them further. These graphs can be found at http://www.globalwarmingclassroom.info/Lesson1_graphs.htm.

Closure:

1. Emphasize key points listed in the Lesson 1 Goals.
2. Check for student understanding with open discussion.
3. Perform student assessments.

Recommended assessments: quizzes, take home essay questions

Following Video Discussion Questions:

1. What is the common misconception regarding climate change? What is the reason behind the misconception?
 - *Many people believe that the earth is warming, when in fact most data that points to warming is gathered from surface data or cities. City temperature is warmer due to heat generated by asphalt not by increase in CO2 levels. Satellite measurement is much more accurate as they provide comprehensive data from around the earth. Balloons also measure temperature in the atmosphere around the world and are in agreement with Satellite readings that the increase is almost unperceivable.*
2. Scientists once believed that 1998 and 2005 were the warmest years ever recorded, and the 1990's and 2000's were the warmest decades in recorded history. What happened in 2007 to change this notion?
 - *In August of 2007 the NASA discovered an error in their data and corrected the error. The corrected data showed that 1934 was the hottest year 1998 2nd hottest year. Out of the 5 hottest years 3 were in the 1920's and 1930's.*
3. What happened to the earth's temperature between the two warm periods of the 1920/1930's and the 1990's?
 - *There was a period of cooling. Media conclude that we were entering a little ice age. Scientific consensus was that there was global cooling.*
4. What happened after 1998 (especially since 2001) to the earth's temperature?
 - *The earth stopped warming and there has been no statistical increase since then.*
5. What happened to the earth's temperature in 2007?
 - *In 2007 the earth's temperature dropped ½ degree Celsius or 0.9 of a degree Fahrenheit even though CO2 (Carbon Dioxide) has increased at a steady rate. If CO2 is the reason*

for Global warming why hasn't the earth's temperature continued to increase each year along with the CO2 levels?

6. Al Gore and the United Nations Intergovernmental Panel on Climate Change have given the strong impression that CO2 changes caused changes in earth's temperature over the past 450,000 to 65000 years. What does this ice core data really show?

- *It was thought that increased CO2 levels caused an increase in temperature, however when the CO2 and temperature graphs are looked at closely it shows just the opposite. CO2 levels rise after the earth's temperature rises.*

7. Why do you think media and other's who are concerned about global warming are unwilling to put the CO2 and earth's temperature line graphs together?

- *Answers will vary. (This could be an extra credit research paper) That said, the primary reason is that the entire global warming issue is politically, not scientifically driven. An extra credit paper should include the facts that:*

1. *many have a commercial interest in which they can make millions of dollars if Congress passes cap and trade legislation. This is a big motivation.*
2. *some scientists have committed their entire careers and reputation to the theory that man is causing global warming.*
3. *some scientists are forced to say that man is causing global warming in some way so they can get their next research grant and stay employed. Some are actually bullied into this position by politically motivated scientists and special interest groups. This is hard to accept, but it is not that uncommon.*
4. *some have accepted that nature is god, which biases their view (this is not common among scientists but it is what motivates many environmental leaders, although not the average environmentalist.)*

8. What happens when the earth's ocean's warm?

As the oceans warm they release CO2 into the atmosphere. The oceans cannot hold as much CO2 when it is warm verses when it is cold. When the oceans cool, they can hold more CO2 so they absorb it from the atmosphere.

9. List 2 naturally occurring producers of CO2.

- *Vegetation*
- *Oceans*
- *Soil*
- *Not listed in the video, but may be known by some students are: animals, insects, volcanoes*

10. Which creates more Carbon Dioxide man or nature?

- *Nature emits more than 97% of the CO2 that into the atmosphere while man only creates less than 3%.*

11. What is the largest contributor to greenhouse gases?

- *Water vapor and clouds is the largest contributor to Greenhouse gasses.*

12. If man caused CO₂ is such a small percentage of the overall greenhouse gas emission, what, in your opinion, would be for never mentioning the overwhelming role of water vapor and clouds on global warming?
- *Opinions will vary. (This could be an extra credit research paper)*
13. When comparing dry desert areas to humid areas, which areas conserve more heat between the day and night temperatures? Why?
- *Humid areas hold more heat at night since water holds heat.*
14. When looking at the graphs detailing climate over the last 4,000 years what do you notice? (Graphs: Earth's Temperature for the Past 11,000 years, 27 Year Global Temperature Data, 250 year Temperatures)
- *There were several periods of time where the earth was warmer than today and temperatures are variable throughout history. Warming and cooling are the norm.*
15. MBH98 or "The Hockey Stick Curve" is widely used by environmentalists and the United Nations to support global warming, but the paper was never audited by peers. Why is it important for research to be audited by peers?
- *Auditing holds people accountable for their work and looks for errors. Simple errors can cause data to be wrong and lead to false assumptions. Tragically, many of these scientists will not allow other scientists to look at their data. That is what happened with the Hockey Stick Curve controversy.*
16. What happened to the data of MBH98 when the report was audited?
- *It was noted that there that data description that accompanied the paper was wrong and there were methodological issues that were not described in the paper. A computer programming error caused the graph to appear like a hockey stick. After the audit the graph showed that the 1500's had temperatures that are just as high as the 20th century.*