

LESSON PLANS and FACILITATOR'S NOTES

MODULE 3



MODULE 3 LESSON PLAN

NOTE: *The Module 3 Facilitator's Notes following this lesson plan provides detailed instructions, a suggested script and additional resources.*

Module: 3

Length of time: 2 hours (1 hour instruction 1 hour activity)

You and a Changing Climate

Materials and Resources Needed:

- Flip chart or board
- Markers
- Computer with CD-ROM projector or TV w/ DVD Player
- Pictures of stranded polar bears, melting ice caps, disappearing glaciers, and other results of global climate change
- Global Climate Challenge worksheet

Objectives:

1. Students will be able to define climate change and verbalize examples of climate change.
2. Students will be able to identify causes contributing to global climate change.
3. Students will be able to verbalize ways they can contribute on a personal level.
4. Students will be able to describe how they will have to adapt to climate change.

Procedures :

SEGMENT 1

1. Get the attention of the students. Show the students the following clip provided by Blue Man Group, <http://www.youtube.com/watch?v=QM-mfEMssy8> . Use of YouTube allows you to maximize the screen; video clip is 1 minute and 50 seconds. If you use the Blue Man Group website you will not have the option of maximizing the screen. (5 minutes).
2. Review module topic and terminology
3. Show the trailer for "An Inconvenient Truth." Discuss the short clip. <http://video.google.com/videoplay?docid=2078944470709189270#>
4. Introduce Climate Change. What is Climate Change? How is Climate Change different from Global Warming? Or is it? (5 minutes)
5. Review with students some examples of the results of climate change and the effects of global warming (e.g., rising and changing temperatures, melting ice caps, rising sea levels).
6. Pass around pictures that show the results of global climate change, including coastal erosion and the effects of severe storms.
7. Discuss adaptation to climate change and how we can be personally prepared. Show video of storm water culvert exploding and ask how we can adapt to lessen this type of change. <http://www.youtube.com/watch?v=9f4wS3hxHYg> (5 minutes)

SEGMENT 2

8. Explain why the climate is changing and how it happens.
9. Review the sources of greenhouse gasses and how it affects climate change.

10. Identify CO₂ and methane. Show “*This is why I’m Hot*” video clip and video about livestock tax.

SEGMENT 3

11. Review how to reduce greenhouse gasses.
12. Complete a carbon footprint for the entire class by using the individual carbon footprints calculated in Module 1.
13. Considering the results of the Carbon Footprint, discuss some things that we can do as individuals to reduce greenhouse gasses. Use a white board to record answers from the students; below are some examples that you should mention if the students do not.
 - Transportation
 - Fuel efficient cars
 - Driving more efficiently, car pooling, using public transportation
 - Eat less meat (1 meal/week)
 - Low carbon diet
 - Plant trees
 - Create less landfill waste (4 R’s)
 - Walk versus drive
 - Take shorter showers
 - Staycations versus vacations
 - Turn computer off at the end of day versus standby or leaving it on
 - Plant trees
 - Buy organic and local
 - Stay away from bottled water, instead use tap or filtered water and store in an inert container (glass, metal or BPA free plastic).
 - Energy proof homes
 - Unplug any electronics not in use
 - Wash clothes in cold water
 - Re-usable bags versus plastic bags
 - Turn off lights when not needed
 - Set thermostats to use less heat/air-conditioning

SEGMENT 4

14. Review the student’s Personal Environment Plan and discuss ways in which to expand it based on today’s discussion
15. Pass out the Global Climate Change Challenge. Have students work together in pairs to complete. This is essentially a quiz, but let’s call it a challenge.
16. Once students complete the challenge review the correct answers.

Terminology:

- **Adaptation** – Responses to the changing climate (e.g., acclimatization in humans) and policies to minimize the predicted impacts of climate change (e.g., building better coastal defenses).
- **Carbon Dioxide (CO₂)** – Chemical element that is composed of 2 Oxygen and 1 Carbon atom. A gas at a standard temperature and pressure and present in the atmosphere.

- **Chlorofluorocarbons (CFC's)** – Set of chemical compounds that deplete the earth's ozone. Widely used in aerosols, solvents, propellants and coolants. These are the main cause of ozone depletion.
- **Clean Energy** – Energy that is renewable, safe and cost effective.
- **Climate Change** – Change in the statistical distribution of weather over a period of time typically a decade or longer.
- **Conservation** – Using natural resources wisely and at a slower rate than normal.
- **Deforestation** – The removal of trees without appropriate replanting.
- **Emission** – A substance discharged into the air, especially by an internal combustion engine.
- **Energy efficiency** - The use of less energy to provide the same or an improved level of service to the energy consumer in an economically efficient way; or using less energy to perform the same function.
- **Efficient** – Being effective without wasting time, effort, energy or expense.
- **Endangered Species** – Population of a species at risk of becoming extinct.
- **Global Warming** – Increase in the average temperature of the Earth's atmosphere.
- **Greenhouse Effect** – When gases in the earth's atmosphere trap in heat and build up ultimately resulting in the increase of the earth's temperature.
- **Greenhouse Gasses (GHG)** – Gas in the atmosphere which absorb or emit radiation. GHG include ozone, water vapor, carbon dioxide, methane, and nitrous oxide.
- **Methane** – Principal Component of natural gas which is colorless and odorless. Methane is considered a GHG. Also produced by mud volcanoes, faults and livestock.
- **Organic** – Food or product made with specific production standards and never using chemical fertilizers, stimulants, antibiotics or pesticides.
- **Ozone depletion** – A slow steady decline in the total amount of ozone in the Earth's stratosphere.

Required Discussion Topics:

1. What is Climate Change? How is Climate Change different from Global Warming?
2. What are the results of Climate Change/Global Warming?
3. What are some specific causes of climate change?
4. What can we do as individuals to reduce our carbon footprint?
5. How might we adapt to Global Climate Change (GCC)?

Suggested Activities:

To be done for the second hour of this lesson; can also supplement the curriculum and be done during structured evening programming or on the weekends.

- **Movies** – *Inconvenient Truth*
- **News report** – Research and report activity on news about Global Climate Change, Greenhouse gases or effect, Low Carbon Diets.
- **Essay** – Students to create essay to entice others on center to make an environmental pledge or challenge; possible opportunity for contest.
- **Website Hunt** – Students to visit websites such as EPA, Union of Concerned Scientists, Arbor Day Foundation, Climate Project, and World Wildlife Foundation. Have students search for facts that they were not aware of or is shocking. Share results with the class.

- **Video Production** – Students to film a PSA for global warming or climate change. If center does not have proper equipment, have the students perform a skit in smaller groups.

Informal Assessment Options:

1. Word Search
2. Global Climate Change Challenge



Academic Concepts:

- Reading
- Critical Thinking
- Science

Career Success Standards Correlation:



- ☑ Personal Growth and Development
- ☑ Workplace Relationships and Ethics
- ☑ Communications
- ☑ Information Management
- ☑ Independent Living Skills
- ☑ Multicultural Awareness
- ☑ Career and Personal Planning
- ☑ Interpersonal Skills


MODULE 3 FACILITATOR'S NOTES


Objectives	
<ol style="list-style-type: none"> 1. Introduce the concept of Climate Change, how it relates to Global Warming and what the other effects could be. 2. Explain how greenhouse gasses are contributing to climate change and identify the major sources. 3. Discuss/review ways that each of us can help reduce the emission of greenhouse gasses. 	
Suggested Script	
Lesson Transition	
ACTION	NARRATION
<p>Review with the students the pledge they designed in Module 2.</p>	<p>Did everyone try to put their pledge into action after class yesterday? What types of things did you do? Was it difficult to make the little changes? Did anyone think of anything else we could add to the Pledge? Remember that it is a living pledge, so changes can be made anytime. The more little things you can pledge to do differently, the more you can shrink your carbon footprint and the better off we'll all be.</p> <p><i><Solicit student discussion.></i></p>
<p>Show the <i>Blue Man Group</i> video introducing climate change.</p>  <p>Introduce the topic of the day and review terminology.</p>	<p><i><Go to http://www.youtube.com/watch?v=QM-mfEMssy8 to play the clip.></i></p> <p>So, I'm sure you've all heard of global warming. As most of you know though, it doesn't always feel warmer, does it? But global warming is a problem, whether we can feel the heat or not. It's important to know that global warming is only a part of the overall issue of climate change.</p> <p>Today we are going to look a little more closely at climate change – one of the major environmental issues that we are facing today.</p> <p>There are lots of important terms that we'll be discussing in this module, so let's take a minute to review them:</p> <p><i><Consult the terminology section located at the end of Module 3 Lesson Plan.></i></p> <ul style="list-style-type: none"> • Greenhouse Effect • Greenhouse gasses (CO₂, Methane) • Climate Change • Global Warming • Efficient • Clean Energy • Emission
Introduction to Climate Change	
<p>Show intro for "An Inconvenient Truth"</p> 	<p>Let's take a look at another clip. <i><Go to http://video.google.com/videoplay?docid=2078944470709189270# and discuss.></i></p>

<p>Explain what climate change is and how it relates to global warming (Note: background info can be found at: http://www.epa.gov/climatechange/effects/extreme.html)</p> <p></p> <p>Show pictures of how coastal erosion is affecting areas now and how severe storms can impact people world-wide.</p> <p></p>	<p>The actual warming of the globe is having a much more drastic effect on the North and South Poles than we can realize where we are. As it heats up, the glaciers and ice caps are melting, increasing the amount of water in the oceans. This will have a huge impact on any coastal areas. Remember that as ocean levels rise, more land is being lost to erosion and coastal storms.</p> <p>When the temperature changes at the Poles it also affects weather patterns around the globe, leading to floods, drought, temperature shifts and more severe storms. Heat waves and cold patterns can get longer, rain events more intense, hurricanes, tornados and typhoons can be more frequent and more powerful. Various parts of the planet could experience flooding, droughts and a shortage of food and water.</p> <p>Longer, more intense and frequent heat waves may cause more heat-related death and illness. There is virtual certainty of declining air quality in cities since greater heat can also worsen air pollution such as ozone or smog. Insect-borne illnesses are also likely to increase as many insect ranges expand.</p> <p>Rising temperatures will intensify the Earth’s water cycle. Increased evaporation will make more water available in the air for storms, but contribute to drying over some land areas. As a result, storm-affected areas are likely to experience increases in precipitation and increased risk of flooding. But areas located far away from storm tracks are likely to experience less precipitation and increased risk of drought. In the U.S., warming is expected to cause a northward shift in storm tracks, resulting in decreases in precipitation in areas such as the Southwest U.S. but increases in many areas to the north and east. However, these changes will vary by season and cannot be predicted.</p> <p>It’s a combination of all of these risks that make Global Climate Change such a threat.</p> <p>So, now that we know what the threat of climate change is, let’s look at how it happens.</p>
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Causes of Climate change/Sources of Greenhouse Gasses

<p>Introduce why the climate is changing and how it happens.</p> <p>Show “This is why I’m Hot” video clip and discuss how what we are doing daily that contributes to climate change.</p> <p> </p>	<p>Climate change is happening, basically, because the sun’s rays are heating up the Earth. What usually happens is that the rays will heat the earth, and then the heat escapes through the atmosphere. Because of the build up of greenhouse gasses, the atmosphere is getting thicker and less heat is able to escape, so it’s trapped in our atmosphere, raising the global temperature.</p> <p><Go to http://www.youtube.com/watch?v=NAtzU6AuD2q&feature=related></p> <p>The video we just saw showed several sources of greenhouse gasses, as well as some of the effects of climate change that we are seeing already.</p>
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<p>Discuss greenhouse gasses and the sources.</p> 	<p>It also introduced a movie called “An Inconvenient Truth” which focuses on climate change.</p> <p>Let’s take a closer look at the sources of greenhouse gasses and later we’ll figure out ways that each of us can help to decrease emission of them.</p> <p>Some of the most common greenhouse gasses are Carbon Dioxide (CO₂), Nitrous Oxide and Methane. There are others, but let’s focus on those for now.</p> <ul style="list-style-type: none"> • What are some sources of Carbon Dioxide? (burning of fossil fuels, wood, manufacturing, breathing) • What about sources of methane? (Production and transport of coal, oil and gas, livestock, rotting garbage in and outside of landfills.) <p>Livestock is a pretty big contributor to greenhouse gasses. According to the EPA, 20% of all Methane emissions come from them. Add in all of the fossil fuels burned during transportation and meat is a pretty big contribution to our greenhouse gas production.</p> <p>Speaking of transportation, let’s look at another key greenhouse gas – CO₂. Burning fossil fuels emits CO₂; this includes natural gas, heating oil, and gasoline. Transportation is a major source of CO₂, whether it’s you and some friends driving to the mall, the trucks hauling goods across country to your favorite store, or the planes being used to ship mail order packages, fossil fuels are being burned and dangerous gasses are being produced. In fact, automobiles account for 30% of the greenhouse gasses emitted.</p> <p>And let’s not forget electricity! While electricity itself doesn’t appear to emit gasses, the production plants that produce it does. By wasting electricity, we are needlessly burning fossil fuels and increasing pollution to light an empty room or power a laptop nobody’s using, or by leaving a charger that’s not being used plugged in. Don’t forget about those phantom energy drains!</p>
<p>Reducing Greenhouse Gasses</p>	
<p>Calculate class carbon footprint by adding the results of the individual carbon footprint exercises from Module 1.</p>	<p>We always hear that planting trees is good for the environment. Has anyone heard that they also help reduce greenhouse gasses?</p> <p>When we breathe, we take in oxygen, and exhale CO₂, a greenhouse gas. Trees, most plants actually, pull the CO₂ out of the air. They use the carbon to help grow bigger, and then they “exhale” the oxygen that we breathe. It’s a great cycle and trees help to keep our air clean. The catch with climate change is that the trees and plants are being affected by all of these changes and are not able to survive. That, coupled with all of the trees we cut down for wood, paper, fuel, is leaving us with fewer trees to combat more pollution.</p> <p>We’ve already looked at what each of our “carbon footprints” was. Now, if we add all of that up, we’ll see how much of an impact we have as a group. Remember that this is only a reflection of how much CO₂ we are each contributing. It has nothing to do with the other greenhouse gasses. It also does not include the carbon footprint of all our “stuff” and its production and transportation.</p>

<p>Discuss ways that we can reduce the amount of greenhouse gasses that we produce.</p>  <p>Review individual pledges and add if appropriate.</p> <p>Handout Global Climate Change Challenge</p>	<p>What are some ways that we can reduce how we are contributing to greenhouse gas production and climate change?</p> <ul style="list-style-type: none"> • How about what we drive? <i><Select student and ask, “If you could drive anything, what type of vehicle would you want? Show examples of the carbon footprint for popular vehicles and discuss by going to http://www.fueleconomy.gov/feq/sbs.htm></i> <ul style="list-style-type: none"> ○ Fuel efficient cars ○ Driving more efficiently, car pooling, using public transportation • Eat less meat (1 meal/week) • Low carbon diet • Plant trees • Create less landfill waste (4 R’s) • Walk versus drive • Take shorter showers • Staycations versus vacations • Turn computer off at the end of day versus standby or leaving it on • Plant trees • Buy organic and local • Stay away from bottled water filter your water instead • Energy proof homes • Unplug any electronics not in use • Wash clothes in cold water • Re-usable bags versus plastic bags • Turn off lights when not needed • Set thermostats to use less heat/air-conditioning <p>From these examples, what do you think you can add to your personal green pledge?</p> <p><i><Time pending, facilitate the Global Climate Change Challenge to wrap up class discussion; have students work in pairs.></i></p>
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One Hour Activity

Each module should be preceded with an activity, approximately one hour in length. This may be conducted after the lesson, during structured evening programming or on the weekends. Below is a list of activities and resources of which to choose:

- **Movies**
 - *An Inconvenient Truth*
 - <http://video.google.com/videoplay?docid=2078944470709189270#>
 - *The Day After Tomorrow*
 - *Global Warming - What's Up With the Weather: This two-hour special from NOVA and FRONTLINE explores the phenomenon of global warming, the controversial opinions surrounding it, and its impact for life on Earth. With record-high temperatures in the early 21st century, this film examines how greenhouse gasses influence climate change. Experts share their interpretations of this phenomenon, man's role in it, and their differing (and often unsettling) predictions for the future.*

- <http://www.pbs.org/wqbh/warming/>
- **Film PSA** – Film a PSA for Global Warming or Climate Change; If centers do not have the equipment, perform a skit. Divide class into small groups and have each develop one.
- **Choose an activity from “50 Simple Things You Can Do To Save the Earth”**
- **News report** – Research and report activity on news about Global Climate Change, Greenhouse gases or effect, Low Carbon Diets.
- **Essay** – Students to create essay to entice others on center to make an environmental pledge or challenge; possible opportunity for contest.
- **Website Hunt** – Students to visit websites such as EPA, Union of Concerned Scientists, Arbor Day Foundation, Climate Project, and World Wildlife Foundation. Have students search for facts that they were not aware of or is shocking. Share results with the class.



MODULE 3 ADDITIONAL RESOURCES:

SECTION	RESOURCE
LESSON TRANSITION	<ul style="list-style-type: none">• Blue Man Group video:<ul style="list-style-type: none">○ http://www.youtube.com/watch?v=QM-mfEMssy8
INTRODUCTION TO CLIMATE CHANGE	<ul style="list-style-type: none">• Wealth of resource links from the EPA:<ul style="list-style-type: none">○ http://www.epa.gov/climatechange/links.html#educators○ http://www.epa.gov/climatechange/basicinfo.html• A 12 minute video explaining climate change and how it can affect local populations (may be a bit long for class):<ul style="list-style-type: none">○ http://www.globalchange.gov/resources/educators/toolkit/video• 3 minute video on weather and climate change<ul style="list-style-type: none">○ http://www.answers.com/topic/climate-change• A great list of emissions calculators<ul style="list-style-type: none">○ http://www.glrppr.org/contacts/gltopichub.cfm?sectorid=143• A FAQ section to prepare you and provide an overview of what climate change may mean in the future:<ul style="list-style-type: none">○ http://www.epa.gov/climatechange/fg/effects.html• For additional information on greenhouse gasses and emissions, specifically carbon dioxide and methane, visit the link below under Human Causes which specifically addresses electricity, waste, transportation and a growing population:<ul style="list-style-type: none">○ http://edugreen.teri.res.in/explore/climate/causes.htm.• Background on climate change/global warming. Also ties climate change to the dinosaur extinction:<ul style="list-style-type: none">○ http://unfccc.int/essential_background/feeling_the_heat/items/2917.php• Quick intro to climate change and how trees can help (1 pager) includes personal carbon calculator:<ul style="list-style-type: none">○ http://www.americanforests.org/resources/climatechange/• How climate change is impacting trees – killing off our main protection against CO₂ levels:<ul style="list-style-type: none">○ http://www.wired.com/wiredscience/2009/01/deadtrees/○ http://latimesblogs.latimes.com/greenspace/2009/08/yosemite-trees-declining-climate-change.html• Related terms defined by Wikipedia:<ul style="list-style-type: none">○ http://en.wikipedia.org/wiki/Global_warming○ http://en.wikipedia.org/wiki/Climate_change○ http://en.wikipedia.org/wiki/Natural_environment○ http://en.wikipedia.org/wiki/Sea_level_rise○ http://en.wikipedia.org/wiki/Extreme_weather○ http://en.wikipedia.org/wiki/Ecosystem○ http://en.wikipedia.org/wiki/UNFCCC

CAUSES OF CLIMATE CHANGE/SOURCES OF GREENHOUSE GASSES	<ul style="list-style-type: none"> • “This is why I’m hot” video on Global Warming (W/ Al Gore and Futurama): <ul style="list-style-type: none"> ○ http://www.youtube.com/watch?v=NAtzU6AuD2g&feature=related • Green Team - intro to climate change info sheet for students • Human causes of climate change: <ul style="list-style-type: none"> ○ http://edugreen.teri.res.in/explore/climate/causes.htm • According to the IPCC Fourth Assessment Report, “[most] of the observed increase in global average temperatures since the mid-20th century is <i>very likely</i> due to the observed increase in human greenhouse gas concentrations:” <ul style="list-style-type: none"> ○ http://en.wikipedia.org/wiki/IPCC_Fourth_Assessment_Report
REDUCING GREENHOUSE GASSES	<ul style="list-style-type: none"> • The Green Team Climate Challenge: <ul style="list-style-type: none"> ○ http://www.thegreenteam.org/ClimateChange07.pdf • Tips on Driving more efficiently: <ul style="list-style-type: none"> ○ http://www.fueleconomy.gov/feg/driveHabits.shtml • Carbon Footprint: add the results of each student to determine entries. It calculates as you proceed at the top of the page. You may want to do some additional homework prior to presenting this to the students. <ul style="list-style-type: none"> ○ http://www.climatecrisis.net/takeaction/carboncalculator/# ○ School carbon footprint calculator <ul style="list-style-type: none"> ▪ http://www.earthteam.net/action_month/images/DriveNeutral%20Total%20Emissions%20Calculator%20-%20SchoolNeutral%200.92b.xls • Energy Star challenge: <ul style="list-style-type: none"> ○ http://www.energystar.gov/index.cfm?fuseaction=challenge.showChallengeForm
ADAPTATION	<ul style="list-style-type: none"> • http://www.epa.gov/climatechange/effects/adaptation.html • What communities can do (Keene, NH) <ul style="list-style-type: none"> ○ http://www.icleiusa.org/news-events/press-room/press-releases/keene-approves-climate-adaptation-action-plan • Climate ready estuaries <ul style="list-style-type: none"> ○ http://www.epa.gov/cre/