
CHAPTER 6

CLIMATE CHANGE

This chapter outlines a 50-minute lesson that focuses on the theme of climate change. The lesson begins with a warm-up activity in which students review the key term "climate change" and participate in a brief class survey to stimulate their interest in the topic of global warming. Students then read and discuss a short article on climate change. Next, they carry out a ranking task that encourages them to reflect more deeply on the effects of global warming. Finally, students write a brief paragraph summarizing what they have learned in the lesson and share their summaries with the class.

As students read, write, and talk about climate change, they improve their language skills by learning and using new vocabulary and concepts related to the topic. Some teachers may choose to present the activities described in the section on [Classroom Applications](#) as a single 50-minute lesson. Others may prefer to combine the activities with some of the materials outlined in the section on [Internet Resources](#) to create a longer lesson or a more extensive unit of several related lessons. The issue of climate change, especially as it relates to global warming, is complex and controversial. There are many questions about the topic, from its causes to its full effects, which cannot be fully covered in a 50-minute lesson. Teachers who want their students to explore the topic more deeply can use the sequence of activities described here as an introductory lesson.



BACKGROUND INFORMATION

The Intergovernmental Panel on Climate Change (IPCC), a United Nations group that was created to give scientific advice on climate change, published its Second Assessment Report in December 1995. According to the IPCC report, there is a great deal of evidence indicating that certain human activities are causing the warming of the Earth's atmosphere. The report says that unless steps are taken to prevent further global warming, the average surface temperature on Earth will rise by about 1 to 3 degrees Centigrade by the year 2100. This predicted change is larger than any climate change the Earth has experienced in the past 10,000 years.

There is some uncertainty about the effects of climate change, but many experts believe that global warming would cause the following:

Health -- Tropical diseases such as yellow fever and malaria would spread to a wider area.

Wildlife -- Many animal and plant species would become extinct because warmer temperatures would cause their habitats to change or disappear.

Oceans -- Sea levels would rise and cause flooding in coastal areas and very serious damage in low-lying countries such as Bangladesh.

Agriculture -- Growing seasons in Canada, Finland, Japan and other countries in the Northern Hemisphere would become longer. However, sizes of wheat, corn and other soybean crops would become smaller, causing food shortages in some areas of the world.

Forests -- Parasites from tropical areas would extend their range and attack forests in temperate zones. Some tree species in temperate zones would become extinct.

Rangelands -- Drought and erosion would become worse, and increase fires would become a problem.

Islands -- If the oceans rise, some small islands, including the Caribbean Islands and **archipelagos** in the Pacific, might disappear.

The main cause of the recent increases in global temperature is **greenhouse gases**, especially **carbon dioxide**, released by coal- and oil-fired power stations, factories, automobiles, trucks, offices, and private homes. As world population and economies grow, more and more greenhouse gases are released. As more and more of these gases enter the **atmosphere**, they trap the Earth's heat and add to global warming.

Until recently, some people argued that no action should be taken against global warming until we know exactly what effects it will have on the environment. However, scientists have shown that major changes in the atmosphere have already taken place, and that these changes will damage the environment. Furthermore, we do not know if these changes are permanent or only temporary. One fact is certain: the longer we delay action against global warming, the more difficult it will become to take effective steps.

In order to prevent further global warming, we would have to immediately reduce carbon dioxide **emissions** by 50-70%. Experts say it would be impossible to do this. However, it is possible to keep amounts of carbon dioxide below danger levels, even though we would still experience an increase in the Earth's temperature. To do this, we have to reduce worldwide carbon dioxide emissions gradually until they are much lower than the current level.

To achieve the goal of keeping carbon dioxide levels below danger levels, the 180 countries that participated in the 1992 United Nations Conference on Environment and Development ("Earth Summit") were invited to sign the United Nations Framework Convention on Climate Change. The goal of the Convention is to eventually stabilize amounts of greenhouse gases at safe levels. The developed countries that are members of the Convention agreed to take steps to reduce their emissions to 1990 levels by the year 2000.

At the climate treaty negotiations held in Kyoto in December of 1997, the parties to the United Nations Framework on Climate Change reached agreement on a historic agreement, the "Kyoto Protocol," for reducing greenhouse gas emissions after the year 2000. The protocol calls for protecting the environment by improving the way energy is produced and consumed, among other measures. According to the agreement, developed countries are legally required to reduce their emissions of greenhouse gases by at least 5% compared to 1990 levels by the period 2008-2012.



CLASSROOM APPLICATIONS

Preliminary Lesson Planning

Materials Preparation:

- Duplicate copies of the article Climate Change in [Appendix A](#) to give for each student.
- Duplicate copies of the task sheet Global Warming: Reaching a Consensus in [Appendix B](#) for each student.

Vocabulary Considerations:

Before using the article Climate Change and the task sheet Global Warming: Reaching a Consensus, consider what vocabulary students will need to know in order to carry out the lesson successfully. Determine which vocabulary items are already familiar to students, and which will be new to them. Some important terms and their definitions are included in the glossary in [Appendix A](#).



WARM-UP ACTIVITY (APPROXIMATELY 10 MINUTES)

Purpose:

- To stimulate students' interest in the topic of climate change
- To activate students' background knowledge about the topic
- To allow students to express their own ideas about the topic
- To introduce and review key vocabulary related to the topic

Procedure:

Write the phrase "climate change" on the board. Ask the class, "What words do you associate with the phrase 'climate change'?" As student volunteers give their answers, write their responses on the board. (The numerous possible student responses include temperature, rainfall, wind, **greenhouse effect**, global warming, weather, atmosphere, carbon dioxide, and sunlight.)

Before asking the next question, write the following three words on the board: Yes, No, Unsure.

Conduct an informal class survey. Ask students, "Do you believe the Earth's climate is getting warmer?" Read off the three words (Yes, No, Unsure) you have written on the board, one at a time, and ask students to raise their hands if it is their answer. Put tally marks under (or next to) each word.

Tell the students that they have probably already heard something about global warming, but there is probably a lot more they would like to know about it. Explain that in this lesson they are going to read an article called "Climate Change" and then work together to share their ideas about climate change, especially the effects of global warming.



ACTIVITY #1 (APPROXIMATELY 15 MINUTES)

Purpose:

- To expose students to some key concepts related to the topic of climate change
- To give students the opportunity to read and use key vocabulary associated with the topic
- To have students practice reading, speaking and listening in a meaningful way

Procedure:

1. Write the following focus questions on the board:
 - *What do you think was the most interesting part of the article?*
 - *Was there anything in the article that really surprised you?*
 - *Why are many people worried about climate change?*
 - *According to the article, how do humans cause climate change?*
2. Divide the class into groups of four or five students and distribute the article *Climate Change*, to each student.
3. Call student's attention to the focus questions on the board. Explain the task to the class. Students are to read the article, and then discuss it in their group, asking one another the focus questions.
4. After pairs have read the article and discussed it in their groups, ask the class the focus questions, one by one. Allow two or three student volunteers to answer each question.



ACTIVITY #2 (APPROXIMATELY 20 MINUTES)

Purpose:

- To have students practice reading, speaking and listening in a meaningful way
- To have students examine some of the reasons people have for being concerned about global warming
- To encourage students to reflect on and make value judgments about the effects of global warming
- To give students the opportunity to express their own points of view about the effects of global warming
- To allow students to work together and listen to their classmates' ideas about the effects of global warming

Procedure:

1. Distribute the task sheet *Global Warming: Reaching a Consensus*, giving one to each student.
2. Explain the task to the students. Working individually, they are to read the task sheet and ranking the reasons from 1 (the reason they feel is the most important) to 7 (the reason they feel is the least important). Then they are to work together in their groups (the same groups they worked with in Activity #1), discussing the items, sharing their ideas, and trying to reach a group **consensus** on how to rank each statement. Finally, they should decide who in their group will present the group's final rankings to the class.
3. Students carry out the task described in Step 2.
4. Students from each group take turns reporting their group's ranking of the seven items on the task sheet. Encourage students to give reasons why their groups ranked the items as they did.



COOL DOWN ACTIVITY (APPROXIMATELY 10 MINUTES)

Purpose:

- To encourage students to reflect on what they have learned
- To give students an opportunity to discuss the relevance of the lesson
- To practice writing
- To conclude the lesson

Procedure:

1. Ask students to write a paragraph summarizing what they have learned in today's lesson and explaining whether or not they believe global warming is a serious issue.
2. Give students five minutes or so to write their paragraphs.
3. After students have written their paragraphs, ask for volunteers to read their paragraphs aloud to the class.



EXTENSIONS

1. Have students research the topic of global warming and carry out a debate. A good source for information about both sides of the scientific argument about global warming is *Global Warming: An Explanation, Weather Eye*. See: <http://weathereye.kgan.com/expert/warming/index.html>
2. Ask students to research the causes of global warming and create a brochure on how we can slow down the process of global warming.
3. Have students take a look at the actual text of the Convention on Climate Change negotiated by 150 nations in the period 1991-92. (The convention text is available at <http://www.unfccc.de/>) For a beginner's guide to the convention, see http://unfccc.int/essential_background/background_publications_htmlpdf/items/1661.php Discuss these questions: What does signing the convention require nations to do? By which year? What effect will these actions have on global warming?
4. Have students research the greenhouse effect and create a flow chart to show how the greenhouse effect causes additional global warming.
5. Have students do a mini-survey on global warming. Students interview ten people to find out their answers to the following questions: Do you believe global warming is a serious problem? Why or why not? Students then write a one-page summary of the responses and tell the class what they learned from the people they interviewed.
6. Refer to the [Internet Resources](#) section for more information and lesson planning ideas.



Climate Change

A lot of people today, including many scientists, are concerned about climate change. But what exactly is climate, and why are so many people worried about it changing?

What is climate?

Climate is the average weather in a particular area over a length of time. For example, if we take 30 years of daily temperature **readings** of a city and average them, the result is what **climatologists** call a "climate normal." If you listen to an evening weather report, the reporter might say something like, "Today the temperature reached 34 degrees. That's 3 degrees higher than the normal temperature of 31." Climatologists obtained that normal temperature of 31 degrees by taking 30 years of temperature readings for that day and averaging them. The climate of a place is the averages of the different weather conditions (temperature, rainfall, wind) of that place.

Why are people worried about climate change?

Since the climate is the averages of weather conditions, each new weather condition that is different from the normal will make a small change in the climate. When the new condition is only a single **random** event (like one very hot day in the middle of winter), there is no reason to be concerned. If, however, we start to have a lot of **abnormal** weather conditions, we start to think that we are experiencing climate change. Many people are concerned about climate change because they are afraid it will cause serious problems for life on our planet, such as melting of the **polar icecaps** and the spreading of tropical diseases.

What causes climate change?

We are only beginning to understand why climate changes, but we know that the main causes are natural. Changes in the amount of energy released by the sun are one cause. Clouds are another cause. Humans also cause climate to change. Have you ever noticed that cities are usually warmer than the countryside around them? That is because factories and cars produce more heat, and also because **asphalt** and **cement** **absorb** heat better than plants and trees. Cities also produce a lot of air pollution that contributes to climate change. Humans also cause climate change in rural areas when they clear forests and plant crops. Different colored crops can change the amount of energy that is absorbed by vegetation. All this human activity on the surface of our planet can cause climate change.

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Global Warming: Reaching a Consensus

The list below presents some of the reasons people have for being concerned about global warming. First rank the reasons from 1 (most important) to 7 (least important). Then work with three or four other students and try to reach a group consensus on how to rank the statements. Be prepared to present your group's final rankings to the class.

___ **Forests would be destroyed.** Global warming would cause parasites from tropical areas to extend their range and attack forests in temperate zones. Some tree species in temperate zones would become extinct.

___ **Some food crops would become smaller.** Global warming would lengthen the growing seasons in Canada, Finland, Japan and other countries in the Northern Hemisphere. However, wheat, corn and other soybean crops would become smaller.

___ **Rangelands would be harmed.** Global warming would increase problems of drought and erosion, and increased fires would become a problem.

___ **Sea levels would rise.** Global warming would cause sea levels to rise and cause flooding in coastal areas and very serious damage in low-lying countries such as Bangladesh.

___ **Tropical diseases could spread.** Global warming could cause tropical diseases such as yellow fever and malaria to spread to a wider area.

___ **Some animal and plant species would become extinct.** Global warming would cause many animal and plant species to become extinct because warmer temperatures would cause their habitats to change or disappear.

___ **Some islands might disappear.** Global warming would cause the world's oceans to rise, and some small islands, including the Caribbean Islands and archipelagos in the Pacific, might disappear.

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