

Kids Can Campaign for Carbon Change and Help Reduce Global Warming

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“This planet cannot sustain this system.”

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Overview

If my fourth grade students were asked about climate and weather and what these meant to them, they'd be able to provide a substantial answer with details about different types of weather, natural disasters, and climate zones. These topics have been taught throughout their elementary education. However, if asked about climate change and global warming, I would venture to say that my students would have a lot less to offer in terms of discussion of the causes and effects, understanding of debated issues surrounding climate change, and the explanation and inquiry about various practical changes that can be made to help mitigate and reduce climate change and global warming. This unit will be helpful in providing additional information about these topics to my fourth graders.

The issues surrounding climate change and global warming have recently been incorporated into the third grade science curriculum in the School District of Philadelphia. However, the degree of impact that these issues are having on the entire world, including the city we live in, are not addressed in detail in the curriculum. I believe elementary-aged students should be exposed to as much information as possible regarding the future of their planet because they will eventually be the ones making decisions that will harm or heal our Earth in years to come. Given information and resources, kids can begin to form opinions, make educated decisions, and even rally for change in their local communities and further.

This unit will be explored in fourth grade, the year after they've been exposed to brief information on global warming and climate change. My hope for this unit is to provide

students with the necessary information about climate change so that they can begin applying what they have learned to their own actions and even have an impact on the decisions of those around them. Some of the content that will be addressed in this unit is the background and history of climate change, the greenhouse effect, and the causes and effects of climate change on various areas of the world. Students will be able to answer the following questions given the information discussed throughout the unit: Why does climate change matter to us? Whom does climate change affect? How much carbon am I contributing to the greenhouse effect? What can we do on a local and global level to help reduce global warming and climate change?

Rationale

According to James Hansen, author of *Perception of Climate Change (2012)*, the greatest barrier to public recognition of human-influenced climate change is the natural variability of the local climate. It is difficult for people to discern long-term climate change when their local weather and climate does not appear to be significantly different or continues to have such variability from day to day and from year to year.

It is crucial that the public understands and appreciates the significance of human-influenced global warming in order to take action in the rapid reduction of fossil fuel emissions. Recent high-profile extreme weather has brought attention to the issue of global warming and many now wonder if the cause is related to human-made greenhouse gases (Hansen, 2012). The public needs to be educated fully on the causes and effects of climate change and the impact they are having globally. This public education should begin at a young age so children are informed about the fragility of our planet.

Background and History of Climate Change

Global temperature naturally varies from year to year and will continue to vary over short-time periods, but what we are seeing happening now is a long-term trend towards global warming. It is important to look at long-term data records because it shows an increase of about 0.85 degrees Celsius over the period from 1880 to 2012 (see Figure 1). Humans have increased atmospheric CO₂ concentration by a third since the Industrial Revolution began and this human activity is now the cause of the recent climate change (Everett, 2012).

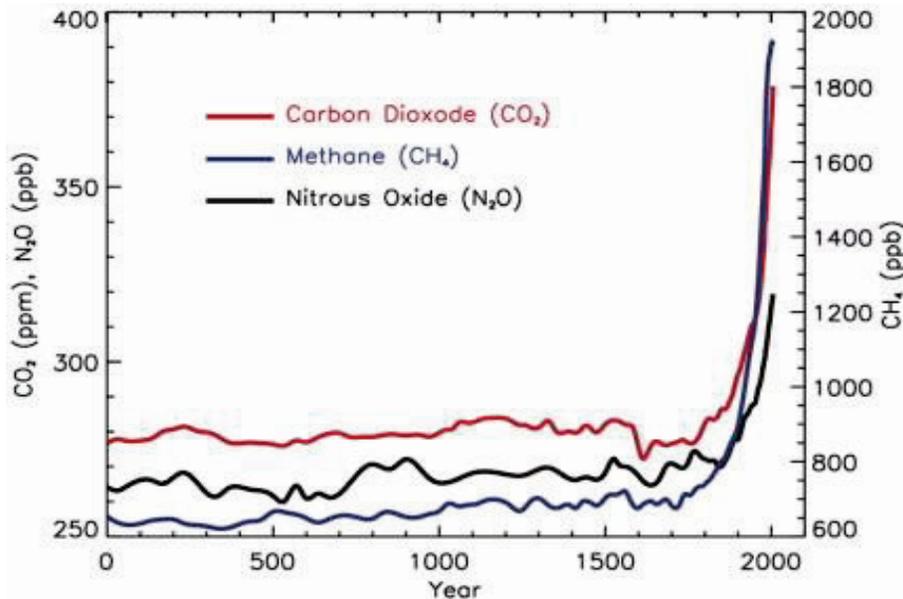


Figure 1: This figure shows the increase of CO₂ over the past 2000 years. The dramatic increase is apparent in the last few decades (Everett, 2012).

Greenhouse Effect-

It is important to recognize that if it were not for greenhouse gases trapping heat in the atmosphere, the Earth would not be a suitable place to live. Mars, for example, has an atmosphere less than 1% of Earth's, so it does not protect the planet from the Sun's radiation nor does it do much to retain heat at the surface. Therefore, life as we know it cannot exist on Mars today. The Moon has a very little thin atmosphere as well, consisting of some gases that are not found in Earth's atmosphere such as sodium and potassium. The moon cannot absorb measureable quantities of radiations and requires constant replenishment due to the high rate at which its atmosphere is lost to space (Pachauri, 2014). The Earth's atmosphere, on the other hand, contains trace gases (water vapor, carbon dioxide, methane, ozone, and nitrous oxide), which are referred to as "greenhouse gases". Greenhouse gases keep the Earth warm through a process called the greenhouse effect. It is called the greenhouse effect because it acts similarly to a greenhouse which is a building made of glass that allows sunlight to enter but traps heat inside. This way, the building stays warm even when it's cold outside. Earth's atmosphere works in a similar way.

The Earth receives its energy from the sun in the form of sunlight (see Figure 2). The sun radiates vast quantities of energy into space, across a wide spectrum of wavelengths. The Earth's surface absorbs some of this energy and heats up, and the Earth cools down by giving off a different form of energy, called infrared radiation. Before the radiation can escape to outer space, greenhouse gases in the atmosphere absorb some of it, which

increases the temperature of the atmosphere. Therefore, the Earth's surface increases in temperature as the atmosphere gets warmer. Carbon dioxide is one of the greenhouse gases that absorbs infrared radiation and serves to keep the heat near the surface of the Earth, effectively insulating the surface from the cold of space (https://www.ucar.edu/learn/1_3_1.htm).

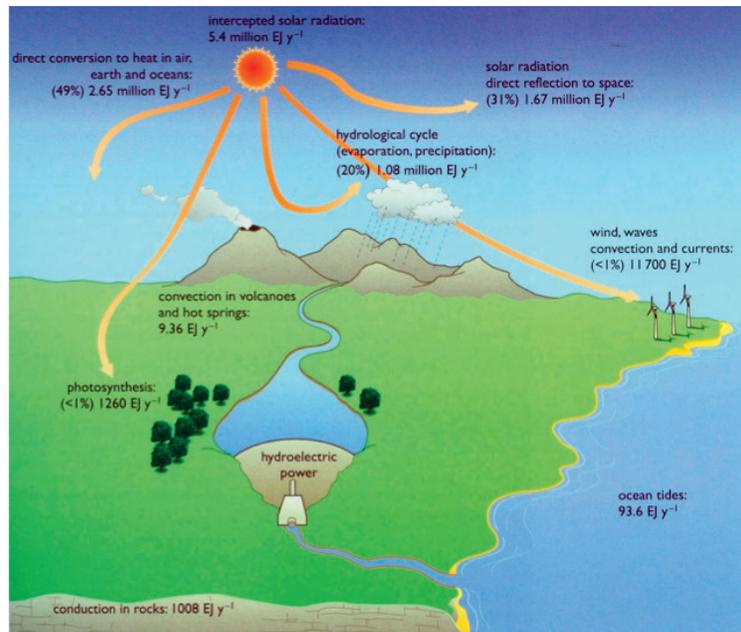


Figure 2. The Earth's surface absorbs some of the Sun's energy and heats up. It cools down by giving off a different form of energy, called infrared radiation (Everett, 2012).

However, as emissions of carbon dioxide and other greenhouse gases increase due to human activity, more heat is trapped in the atmosphere, which leads to an increase in temperature (See Figure 3). Some human activities that release greenhouse gases into the atmosphere are as follows (Pachauri, 2014):

- Carbon dioxide has increased from the use of fossil fuels in transportation, building heating and cooling, and the manufacturing of cement and other goods.
- Deforestation also has an indirect effect because the uptake of CO₂ by trees and other plants is decreased when they are cut down or removed from the environment.
- Methane has increased as a result of activities related to agriculture, natural gas distribution, and landfills.
- Fertilizer use and fossil fuel burning emit nitrous oxide.
- Ozone is continually produced and destroyed in the atmosphere by chemical reactions. Human activities have increased ozone through the release of carbon

monoxide, hydrocarbons, and nitrogen oxide, which chemically react to produce ozone.

It is important to note that there are also natural causes for the increases of greenhouse gases. In fact, carbon dioxide levels have naturally been higher than they are today long before humans existed. By analyzing a number of indirect measures of climate such as ice cores, tree rings, glacier lengths, pollen remains, and ocean sediments, scientists have been able to piece together a record of Earth's climate dating back in some cases to millions, and even hundreds of millions, of years. However, the rate at which the carbon dioxide increased in these cases was much slower than it is happening today. Some natural causes for the increase of greenhouse gases are as follows (Pachauri, 2014):

- Carbon dioxide released by the decay of plant matter and volcanic eruptions.
- Methane is released from natural processes in wetlands.
- Natural processes in soils and the oceans emit nitrous oxide (Pachauri, 2014)..

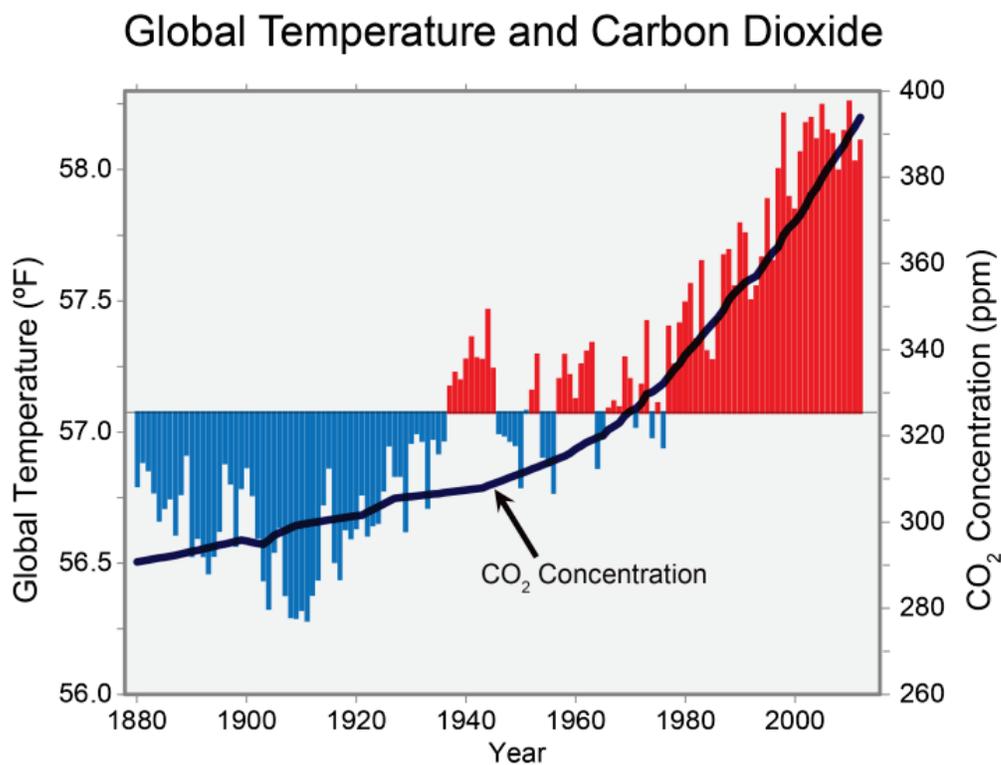


Figure 3. As CO₂ concentration levels increase, global temperatures are directly affected (Pachauri, 2014).

Effects of Climate Change

There is ample evidence and research that supports global warming and the effects of it are undeniable. According to the National Climate Assessment, Americans are noticing changes all around them including longer and hotter summers, extended periods of unusual heat last longer than anyone has ever experienced in America, shorter and warmer winters, heavier rain, longer and more severe seasonal allergies, and changes in the types of plants that can thrive in a local environment and the kinds of birds seen. Others experience more dramatic changes such as more flooding in coastal cities as sea ice is melting and causing a rise in sea level. Ocean water is also becoming more acidic as it absorbs carbon dioxide from the air and the frequency and intensity of extreme weather is increasing (<http://nca2014.globalchange.gov/highlights/overview/overview>).

Human activities are the primary cause of the global warming over the past 50 years. As shown above in Figure 3., the reason global warming takes place is because there is an increase in the concentration of carbon dioxide in the atmosphere. With this increase of more than 40% since the Industrial Revolution comes a change in temperature through the layers of the atmosphere, with warming near the surface and cooling higher in the stratosphere. The burning of coal, oil, and gas, and clearing of forests has led to the buildup of greenhouse gases that have caused most of the Earth's warming (Kennedy, 2010).

It is important to note some of the indicators measured globally over many decades showing Earth's climate is warming are as follows (Kennedy, 2010):

- water vapor rising
- temperature over oceans rising
- sea surface temperature rising
- sea levels rising
- ocean heat content rising
- air temperature near surface (troposphere) rising
- temperature of land rising
- sea ice melting
- glaciers and ice sheets melting
- snow cover melting

Who is Climate Change Affecting?

Climate change is a global issue that will affect everyone in some way on this planet. It should matter to us all because through the actions of humans, this fragile home that we call Earth is slowly dying. If changes are not made immediately on a local and global level, our Earth and everything living on it will not survive much longer.

According to research, summer is probably the season when climate change will have its biggest impact on humanity. Global warming causes spring weather to come earlier and cooler conditions of fall to be delayed. This has significant impact on agriculture, food production, weather patterns, and much more. Warmer winters also have important effects such as pest and disease outbreaks and the disturbance of hibernation and migration patterns. There are also major shifts of ecosystems to higher latitudes and altitudes that are creating great dangers for certain species. For example, the Australian species of tree kangaroos are being directly impacted by climate change. This species lives in mountainous areas that provide a cool environment which allows the tree kangaroo to keep their body temperature down and get moisture from dew that forms under the rainforest canopy. As atmospheric temperatures are increasing, the size of these important mountainous habitats is reducing. Also, the increased atmospheric carbon dioxide could affect plant material and provide less nutritious food for the tree kangaroos. This species is already endangered and subjecting them to an even smaller habitat size will pose an even greater threat to them (World Wide Fund, 2008).

Changes of global temperature are likely to have their greatest practical impact via effects of the water cycle. Elementary students have background knowledge on the water cycle and will be able to use this prior knowledge to apply it to the changes that will occur from global warming. Where summer conditions will be affected the most because of climate change, extreme drought conditions can occur due to the temperature rise and surface heating from the increased greenhouse gas amounts. The other extreme of the water cycle would be unusually heavy rainfall and floods. A warmer world brings more extreme rainfall occurrences because the amount of water vapor that the atmosphere holds increases rapidly with temperature. Climate fluctuations are normal, however, the rapid global warming in past decades is highly unusual (Hansen, 3).

According to the National Climate Assessment, insurance rates are rising in some vulnerable locations, and insurance is no longer available in others. People in these areas are either moving to new locations or taking a financial and life risk by remaining there. Hotter and drier weather combined with earlier snowmelt has caused wildfires in the West to start earlier in the spring and last later in the fall. In Alaska, the summer sea ice that once protected the coasts has receded and storms now cause more erosion, which threatens many communities along the coast. The threat of many polar ice caps melting, including the rapidly disappearing Greenland ice, puts coastal communities in much danger. However, shipping across the Arctic becomes possible with the ice caps melting and this would be considered a positive impact of global warming.

Scientists who study climate change confirm that these observations are consistent with significant changes in Earth's climatic trends. The information is gathered from long-term records from weather stations, satellites, ocean buoys, tide gauges, and many other data sources. Some of the effects that have been found are that precipitation patterns are changing, sea level is rising, the frequency and intensity of some weather

events are increasing, coral reefs are bleaching, wildfires are increasing, more mosquitoes are carrying more diseases, the arctic is melting, and the oceans are becoming more acidic. According to National Geographic, the ocean environments are being “undone by a recent and rapid drop in surface pH that could have devastating global consequences.” Due to the fossil fuel-powered machines since the beginning of the industrial revolution in the early 1800s, the emission of billions of tons of carbon dioxide (CO₂) and other greenhouse gases has been absorbed by our atmosphere. The oceans have absorbed about half of this CO₂ over time, which has benefited us in a way because if they had remained in the air, climate change could have increased more rapidly. However, the resulting higher acidity of ocean water inhibits shell growth in marine animals, or even dissolve shells and corals, and is suspected as a cause of reproductive disorders in some fish. Roughly 22 million tons of CO₂ emissions is absorbed by the ocean on a daily basis and unless humans are able to control and eventually eliminate our fossil fuel emissions, ocean organisms will continue to suffer once the ocean has reached capacity, more CO₂ will remain in our atmosphere (Ocean Acidity, 2016).

Objectives

The goal of this unit is to have fourth grade students develop a deep understanding of the causes and effects of global warming and climate change and apply the information further by determining what can be done on a local and global level to decrease the problems. Students will learn about the history and background of climate change, research the causes of climate change, and understand how the increased levels of carbon dioxide in the atmosphere ultimately increase the temperature of the planet by trapping greenhouse gases in the atmosphere. They will research which human activities release carbon dioxide into the atmosphere (i.e., driving motor vehicles, power plants, etc.), or decrease the natural removal of carbon dioxide (i.e., cutting down trees, deforestation, etc.), and will understand the changes that need to be made to address this problem. Students will be able to create a graph, based on their research, which displays the amount of carbon dioxide released from human activities.

By the end of this unit, students will be able to understand what the greenhouse gases are, where they come from, and what their effect is on the environment. They will research various environmental effects of greenhouse gases around the world in order to make claims and provide evidence to support their claim in relation to human impact on the Earth. They will be able to describe what happens to an organism when its food supply, access to water, shelter, or space is changed in order to explain how parts in a system work together and impact each other. The Australian Tree Kangaroo would be one example that the students could research in order to gain insight into the impact of climate change.

These objectives will provide students with the background knowledge necessary to begin applying what they learned to extension activities such as developing questions to

compile for interviews with people in their community. Students will interview family members, neighbors, and school staff in order to find out how large each person's carbon footprint is. They will develop and ask questions about their means of transportation, food choices, shopping experiences, electronic usage, etc. They will then use a carbon footprint calculator to determine an estimate of how much carbon each person is responsible for in the atmosphere.

Finally, this unit's objective is for students to identify specific ways that human actions affect the climate in order to provide examples of how to reduce the effect. They will develop a campaign for their community, based on the findings of their interviews, which will address specific changes that should happen to reduce the carbon footprint to the community as a whole. Students will use creative strategies to promote their campaign and distribute their message (i.e., use recycled materials to make signs and develop slogans that suggest changes, provide various tips for people to reduce their carbon footprint, etc.).

Strategies

Close Reading

According to the Partnership for Assessment of Readiness for College and Careers, "a significant body of research links the close reading of complex text- whether the student is a struggling reader or advanced- to significant gains in reading proficiency and finds close reading to be a key component of college and career readiness"(Boyle, 2013). Close reading means reading to uncover layers of meaning that lead to deep comprehension.

This strategy will be effective in this unit because students will need to develop deep understanding of global warming and climate change in order to apply this knowledge to extension activities such as interviews and campaign development. "Directing student attention on the text itself empowers students to understand the central ideas and key supporting details" (Boyle, 2013). Students are also able to reflect on the meaning of individual words and sentences when they close read an article multiple times. They will ultimately arrive at an understanding of the text as a whole and be able to form claims and provide evidence to support them.

Higher Order Thinking Questions (Revised Bloom's Taxonomy)

There is ample research that shows the importance of higher-order thinking skills being taught to students. Teaching higher-order thinking skills involves more than just conveying understanding. Students need to learn concepts and then be given opportunities to apply them to various problems, or they may solve problems and then identify the concepts that underlie the solutions.

By having students apply the content, they are putting the content in another context. Both lower-order and higher-order thinking skills are crucial in any classroom, but research shows that students who can convey higher-order thinking skills most often outperform students whose teachers expose students solely to lower-order thinking skills (Wenglinsky, 2001). In this unit, students will learn the content about climate change and global warming and then they will be given the opportunity to apply the content to real world situations as they are interviewing people in their community and developing a campaign to encourage change in the community.

Science Notebooks

Science notebooks can be used in the science classroom to help students develop, practice, and refine their science understanding. They can respond to experiments and investigations by organizing their thoughts regarding the new information. Science notebooks also help students enhance their reading, writing, mathematics, and communications skills. They offer many opportunities to develop and enhance students' communication, written, visual, and oral skills. Even students who may have poor writing skills can use observational drawings and graphs to show their learning. Teachers can use these notebooks to guide their teaching and take note of misconceptions and mastery of skills. They can formatively assess concept development at the student's ability level (Gilbert, 2005).

Problem- Based Learning

The best way for students to learn science is to experience the problems and try to solve them. To do this, real-world problems are presented for students to investigate what they need to know and want to know. In a problem-based learning environment, students take responsibility for what is learned and how it is learned. The teacher guides the investigations through challenging questions and well-planned lesson structure, but the students use collaboration and inquiry to problem-find, problem-solve, and evaluate results.

Lessons

Lesson 1: What is climate change?

Objectives:

- Students will be able to make observations about pictures in order to identify some major effects of climate change.
- Students will be able to identify what climate change is in order to provide examples of what specific human activities influence climate change.
- Students will be able to identify greenhouse gases in order to explain how greenhouse gases can impact global warming.

Materials:

- A variety of pictures (factories, cars, ice caps, coral reefs, etc)
- Science notebooks and pencils
- Cause and Effect Chart

Activity: The teacher will show students various pictures that include some causes and effects of climate change to engage interest in the unit. Students will discuss what they observe in the pictures and make predictions about how they think the pictures are related in terms of climate change. Students will brainstorm connections using what they know about each picture and writing their ideas in their notebooks. The teacher will then explain the connections between the pictures (i.e., Partly due to the large number of vehicles being driven, there are high levels of CO₂ in the air that are being trapped in our atmosphere. Some of the CO₂ is being absorbed by oceans which is a contributor to coral reef bleaching.) Students will complete a cause and effect chart to organize the information they learned about the different images.

Duration: 45 minutes

Lesson 2: What impact do humans have on the climate change?

Objectives:

- Students will be able to research various human activities in order to collect data on how much effect each activity has on climate change and global warming.
- Students will be able to create a graph or chart in order to display the range of human activities that release greenhouse gases into the atmosphere and affect climate change.

Activity:

Students will begin researching the cause of climate change by finding out which human activities produce greenhouse gases into the atmosphere and what affect they have on the planet. They will organize and display their information in a graph by showing which activities have the least to most negative impact on the environment.

Materials: various articles/books, laptops/computers, access to Internet, paper to display chart, pencil

Duration: 45 minutes/2 days

Lesson 3: Who, what, and where does climate change affect?

Objective:

- Students will be able to explain the effect that climate change has on people, animals, and habitats in order to identify patterns
- Students will be able to identify what happens to an organism when its food supply, access to water, shelter, or space (niche/habitat) is changed in order to explain how parts in a system work together and impact each other.
- Students will be able to identify a specific animal affected by climate change in order to write an imaginative letter from that animal's perspective.

Materials: various articles/books, laptops/computers, access to the Internet

Duration: 45 minutes/2 days

Lesson 4: What is a carbon footprint and how can we identify how big our carbon footprint is?

Objective:

- Students will identify activities that produce carbon in order to compile a list of questions that can help determine how much carbon a person contributes to the atmosphere.
- Students will question people in their neighborhood in order to heighten awareness about climate change and identify the carbon footprint of local people.

Activity: Students will use their research from the past few lessons to identify activities that produce carbon so that they can compile a list of interview questions to ask people in their neighborhood. They will also look up “carbon footprint calculator” questions that will provide additional questions to ask. These questions will help them determine how much carbon each person contributes to the atmosphere.

Some examples of questions are: What kind of house do you live in? How many people live in your house? What kind of heating/cooling system do you use? How warm do you keep your home in the winter? Do you regularly turn off your lights and appliances when you are not using them? How do you get to work/school? What kind of vehicle do you/your parents drive? How often do you fly in a plane? How often do you eat out or order food at a restaurant? How often do you do laundry?

Materials: research collected previously, laptops/computers, access to the Internet, science notebooks

Duration: 45 minutes

Day 5: Interpreting and Analyzing the Interview Data

Objectives: Students will be able to interpret and analyze the interview data in order to calculate how much carbon each person contributes to the atmosphere. Students will be able to use a carbon footprint calculator in order to calculate how much carbon each person contributes to the atmosphere.

Materials: <http://www.nature.org/greenliving/carboncalculator/> (or other carbon footprint calculator), data from interviews

Activity: Students will choose a carbon footprint calculator to enter the data that they collected from the interviews. They may need to use a combination of different calculators depending on the questions that they asked and what questions each calculator takes into consideration.

Duration: 45 minutes

Day 6-7: Create a campaign that identifies the needs of your community.

Objectives:

- Students will be able to identify specific ways that humans' actions affect the climate in order to provide examples of how to reduce the effects.
- Students will be able to evaluate the effects of using nonrenewable resources in order to make conclusions about the benefits of using renewable resources for energy.
- Students will be able to develop a campaign in order to promote change in human activities that would reduce the negative impact on the environment.

Materials: various recycled materials (i.e., cans, bottles, newspapers, boxes), glue, markers, science notebooks, pencils, poster board

Activity: Students will develop a campaign that will use recycled materials to advertise ways to help reduce the amount of carbon one contributes to the atmosphere (directly or indirectly). They will brainstorm ideas such as using renewable energy in homes and at school, weatherizing homes, investing in energy-efficient appliances, eating locally, use LED light bulbs, drive a fuel-efficient vehicle when necessary, bike or walk whenever possible, carpool, and more.

Duration: 45 minutes/2-3 days

Standards

PA Standards

3.1.4.A9

- Distinguish between scientific fact and opinion.
- Ask questions about objects, organisms, and events.
- Understand that all scientific investigations involve asking and answering questions and comparing the answer with what is already known.
- Plan and conduct a simple investigation and understand that different questions require different kinds of investigations.
- Use simple equipment (tools and other technologies) to gather data and understand that this allows scientists to collect more information than relying only on their senses to gather information.
- Use data/evidence to construct explanations and understand that scientists develop explanations based on their evidence and compare them with their current scientific knowledge.
- Communicate procedures and explanations giving priority to evidence and understanding that scientists make their results public, describe their investigations so they can be reproduced, and review and ask questions about the work of other scientists.

3.4.4.A2: Understand that systems have parts and components that work together.

3.4.3.B2: Explain how materials are reused or recycled.

3.4.4.B2: Explain how the use of technology affects the environment in good and bad ways.

4.1.4.A Explain how living things are dependent upon other living and nonliving things for survival. Explain what happens to an organism when its food supply, access to water, shelter or space (niche/habitat) is change.

4.1.4.E Explain that ecosystems change over time due to natural and/or human influences.

3.1.4.C1

Identify different characteristics of plants and animals that help some populations survive and reproduce in greater numbers.

Describe how environmental changes can cause extinction in plants and animals.

Eligible Content - S4.A.1.3.3 Observe and describe the change to objects caused by temperature change or light.

S4.A.1.3.4 Explain what happens to a living organism when its food supply, access to water, shelter, or space is changed (e.g., it might die, migrate, change behavior, eat something else).

S4.A.1.3.5 Provide examples, predict, or describe how everyday human activities (e.g., solid waste production, food production and consumption, transportation, water consumption, energy production and use) may change the environment.

4.1.4.E Explain that ecosystems change over time due to natural and/ or human influences.

4.3.4.A Identify ways humans depend on natural resources for survival. Identify resources used to provide humans with energy, food, employment, housing, and water

4.4.4.A Describe the journey of local/global agricultural commodities from production to consumption.

Eligible Content - S4.A.1.1.2 Identify and describe examples of common technological changes past to present in the community (e.g., energy production, transportation, communications, agriculture, packaging materials) that have either positive or negative impacts on society or the environment.

4.5.4.A Identify how people use natural resources in sustainable and non-sustainable ways.

4.5.4.C Describe how human activities affect the environment.

4.5.4.E Identify different ways human health can be affected by pollution.

Common Core Standards

Reading Informational Text

RI.4.1 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.

RI.4.9 Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably.

Speaking and Listening

SL.4.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 4 topics and texts, building on others' ideas and expressing their own clearly.

SL.4.2 Paraphrase portions of a text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally.

SL.4.4 Report on a topic or text, tell a story, or recount an experience in an organized manner, using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.

Next Generation Science Standards

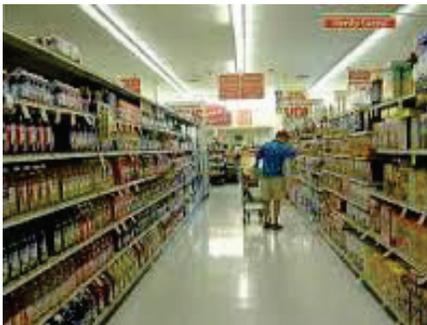
4-ESS3-1. Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.

[Clarification Statement: Examples of renewable energy resources could include wind energy, water behind dams, and sunlight; nonrenewable energy resources are fossil fuels and fissile materials. Examples of environmental effects could include loss of habitat due to dams, loss of habitat due to surface mining, and air pollution from burning of fossil fuels.]

Appendices

Appendix 1

Day 1: In what ways do you think these pictures are related?



Appendix 2

Cause and Effect

Fill out the chart in order to show the relationship between the two images related to climate change. Describe or draw a picture of the cause and describe or draw a specific effect it has on something in the world.

Cause	Effect

Annotated Bibliography

Teacher Resources

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This article explains the greenhouse effect and how it is influencing our Earth.

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This article provides reasons why science notebooks are beneficial to students.

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This article provides detailed information about the causes and effects of climate change all over the globe. There are significant examples that illustrate its global effect.

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This article contains a helpful visual that labels examples of climate change and global warming.

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The Greenhouse Effect. (n.d.). Retrieved April 28, 2016, from https://www.ucar.edu/learn/1_3_1.htm
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Retrieved on February 8, 2016 from <https://www.ets.org/Media/Research/pdf/RR-01-19-Wenglinsky.pdf>.
This article explains the importance and affects of asking higher order questions in classrooms.

World Wide Fund (2008). *Australian Species and Climate Change*. Retrieved on March 2, 2016 from http://awsassets.wwf.org.au/downloads/sp029_australian_species_and_climate_change_25mar08.pdf.
This article describes some of the affects that climate change is having on Australian species such as the tree kangaroo.

Student Resources

Environmental Protection Agency. <<https://www3.epa.gov/climatechange/kids/>>
EPA website for kids about climate change.

Global Footprint Network.

<http://www.footprintnetwork.org/pt/index.php/GFN/page/footprint_calculator_frequently_asked_questions/>

Website with carbon footprint questions and calculator.

National Aeronautics and Space Administration. <<http://climatekids.nasa.gov/climate-change-meaning/>>

NASA website for kids about climate change.

World Wide Fund For Nature. <http://footprint.wwf.org.uk/questionnaires/show/1/3/12>

Website with carbon footprint questions and calculator.