

A Review of Ethical Concepts and Moral Reasoning Integration into Climate Change Curriculum

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Responses

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Introduction and Purpose

Global climate change is one of the most urgent environmental issue facing our society and students. Environmental educators stand on the front lines of this environmental crisis as they prepare students to become engaged citizens on our fragile planet. Many educators are skilled at presenting the facts and engaging students in critical thinking. However, teaching the facts, discussing the predicted trends, and explaining how much environmental damage has already been done often leaves students in a state of despair, or even worse, apathy. And yet, one of our most pressing needs in society are students who are cautiously hopeful, empowered to act, and determined to find solutions to our most daunting environmental problems, despite the overwhelming facts.

As educators prepare students to help society make the difficult turn toward a more sustainable life, educators need expanded resources and lessons and new ways of engaging students. We believe integrating ethical concepts and moral reasoning into curricula is crucial to the success of environmental education. Yet the notion that moral convictions, in addition to factual knowledge, must be included in the public discourse about climate change challenges the dominant paradigm of environmental education, which is to teach the causes and effects of climate change and hope that, through a scientific understanding, students will become citizens who make informed lifestyle and policy decisions.

The anthology *Moral Ground: Ethical Action for a Planet in Peril* by editors Kathleen Dean Moore and Michael Paul Nelson (2010) makes a compelling argument that ethical reasoning and premises are the missing link between knowledge and action. The editors posit that society has not acted to avert the harms of climate change because the affirmation of moral responsibilities has been missing from public discourse. They write:

No amount of factual information will tell us what we ought to do. For that, we need moral convictions—ideas about what it is to act rightly in the world, what it is to be good or just, and the determination to do what is right. Facts and moral convictions together can help us understand what we ought to do—something neither alone can do. (xvii)

Moore and Nelson use an ethical argument to illustrate the role of moral obligations in creating action, as illustrated below (xviii).

The factual premise

If we do not act soon, anthropogenic environmental changes will bring serious harms to the future.

The moral premise	We have a moral obligation to avert harms to the future, so as to leave a world as rich in life and possibility as the world we inherited.
The conclusion	Therefore, we have a moral obligation to act, and act now.

Environmental education plays a crucial role in informing students about environmental harms and it provides the first premise of the argument: the environmental emergencies are real, they are unprecedented in scale, and they are occurring now. However, the moral premise has not been traditionally included in science education.

In this paper we provide educators in classrooms and learning centers with resources that incorporate moral and ethical concepts into science or social science curriculum. Specifically, our goals are to provide an overview of existing curriculum that deals with the ethical dimensions of climate, discuss the need to more fully incorporate the exploration and expression of morals into climate change curriculum, and present three active-learning lessons that we developed to integrate moral reasoning into learning about climate change.

Methods

We reviewed existing science lessons that are focused on climate change to determine the extent to which aspects of the moral premise are currently addressed. All of the lessons we reviewed were available online for free. To identify lessons, we included the search terms *climate change* and *education* with key ethical concepts such as *justice, equity, equality, ethics, fairness, moral, and responsibility*. We define ethical concepts as terms that are commonly associated with the study of morals. Of the approximately 50 lessons we reviewed, 17 contained ethical concepts.

We categorized these 17 lessons in two ways. First, we categorized them according to the ethical concepts they taught. Second, we categorized lessons according to thinking and reasoning skills that commonly appear in learning standards. These skills are important components of developing and acting on moral premises. The thinking and reasoning skills also provide a useful connection between the lessons and national and state standards.

Review of Climate Change Curriculum

Ethical Concepts

We developed posteriori categories for ethical concepts by reviewing lessons and then categorizing lessons according to the ethical concepts they addressed (Table 1). Three ethical concepts emerged in the lessons. First, activities that include **equity** introduce the ideas of fairness and justice among individuals (interpersonal equity), among nations (international equity), between current and future generations (intergenerational equity), and between human and nonhuman species (interspecies equity). Second, activities that include **moral imagination** encourage students to imagine new possibilities and perspectives (e.g., students image climate change from the perspective of a butterfly or a person in a low-lying coastal village). Third, activities that include **moral responsibility** address the idea that a person or community has moral obligations.

Of the 17 lessons we identified, 13 (76%) incorporated equity. The most common concepts were interpersonal equity (7 lessons) and international equity (6 lessons).

Interpersonal equity was a component of lessons such as *No Fair! The Inequities of Climate Change*, *Energy Policies for a Cool Future*, and *Global Nations International Climate Summit*. These lessons engaged students in

comparing carbon dioxide emissions and/or impacts of climate change across real or imaginary countries and in designing a treaty or evaluating or debating mitigation strategies.

Thirteen lessons (76%) encouraged students to use moral imagination. For example, in Facing the Future's lesson *Effects of Climate Change on Living Things*, students work in small groups to learn about and imagine the potential impacts of climate change on living things in a variety of ecosystems (e.g., humans in Northern Europe, polar bears, sea turtles), and then students communicate these impacts to their peers through informative posters. In Keystone Curriculum's *Global Nations International Climate Summit*, students imagine how climate change might affect various nations and then participate in a forum and discuss their decision-making process regarding their country's mitigation choices.

Moral responsibility was not the main focus of any of the lessons we reviewed; however, the concept was touched on in three of the lessons (18%). For example, in Facing the Future's lesson *Energy Policies for a Cool Future*, students compare energy use and carbon dioxide emissions by country and per capita in developing and developed countries. Students then discuss energy impacts and suggest policies for addressing global climate change related to energy. At the end of the lesson, students are presented with reflection questions, two of which encourage students to think about responsibility broadly:

Do you think that people in both developed and developing countries share equal responsibility in tackling climate change? If not, which type of countries should bear greater responsibility for implementing climate change solutions? Why?

Sustainability means meeting current needs without compromising the ability of future generations to meet their needs. How can developing countries meet their growing energy needs and develop in a sustainable manner? Why might developed countries be interested in helping developing countries to grow in a sustainable manner?

While these questions do not explicitly ask students to think about moral responsibility, they do set the stage for this discussion.

Thinking and Reasoning Skills

In addition to reviewing lessons for ethical concepts, we also reviewed lessons according to how they engaged students in using skills, such as critical thinking and formulating cogent arguments. These thinking and reasoning skills often appear in national and state standards for learning, likely to a greater extent than ethical concepts, which offers teachers a justification for fitting these lessons into their classroom curriculum.

To categorize lessons according to these skills, we developed a priori categories based on some of the thinking and reasoning skills, which were synthesized from standards documents from professional subject-area organizations and selected state standards¹. Specifically, we evaluated lessons for the following skills: student 1) understands and applies the basic principles of presenting an argument, 2) understands and applies basic principles of logic and reasoning, 3) effectively uses mental processes that are based on identifying similarities and differences, 4) applies basic trouble-shooting and problem-solving techniques, and 5) applies decision-making techniques.

¹ <http://www.mcrel.org/compendium/SubjectTopics.asp?SubjectID=21>; #4 omitted because of focus on "scientific inquiry"

Most of the lessons (88%, or 15 out of 17) we reviewed contained thinking and reasoning skills. Eleven (65%) of the lessons incorporated decision-making skills, for example deciding on a mitigation strategy based on equity, environment, and economics in *Global Nations International Climate Summit* by Keystone Curriculum. Will Steger Foundation's *International Climate Negotiations* asked students to use logic and reasoning to predict which countries would accept different types of climate proposals based on equality, responsibility, or capacity.

Identifying similarities and differences was a skill in eleven (65%) of the lessons we reviewed. These lessons usually asked students to find similarities and differences between countries and their use of energy and/or risk of impact due to climate change (e.g., *No Fair, the Inequities of Climate Change; Changes All Around; Energy Policies for a Cool Future*) or between sustainable practices (e.g., *Triangle Triage, Energy Exploration*).

Implications for Future Curriculum Development

All of the lessons we evaluated provided an inroad to discussing moral premises in the classroom; however, very few of the lessons discussed moral premises in depth or encouraged students to act given their knowledge of scientific and moral premises. Many lessons provided important framework for developing moral premises by introducing thinking and reasoning skills; however, the lessons did not focus on encouraging students to use these skills to make moral arguments.

Because we developed posteriori categories for ethical concepts, concepts that are not included in Table 1 likely represent opportunities for future curricula development. *Moral Ground* provides a framework that could serve as a reference guide for developing lessons that are focused on moral concepts beyond the concepts that we identified above. Editors Moore and Nelson categorized essays according to three types of moral arguments, each of which could serve as the basis for lessons. First, moral arguments based on the consequences of acting or failing to act might include lessons that encourage students to examine the consequences of actions on other species, the planet, future generations, etc. Second, moral arguments based on doing what is right could include lessons that focus on the intention of an action. For example, students might determine that an act is just if it honors the rights of species, demonstrates gratitude toward natural resources, or shows reciprocity to the atmosphere and climate system. Finally, moral arguments based on virtue could be explored through lessons that encourage students to examine what virtues they think are important (e.g., compassion, love, integrity) and then explore how climate change does or does not support those virtues. Ideally, after each lesson, the students' theoretical explorations of moral arguments would be grounded in questions that encourage them to think about their actions in relation to their knowledge of the facts and their understanding of what they value and believe is right.

For example, let's look at the first category—moral arguments based on the consequences of acting or failing to act. Several lessons encouraged students to examine the consequences of their daily actions by calculating the carbon emissions related to those actions (e.g., Facing the Future's *It All Adds Up*). These lessons could be expanded to incorporate an examination of moral premises based on consequences. The argument might take this shape:

The factual premise	Carbon dioxide emissions worsen the effects of climate change on future generations (or people in low-elevation communities, or species that depend on icy habits to survive).
The moral premise	We have a moral obligation not to do things that will harm future generations (or people in low-elevation communities or species that depend on icy habitats to survive).

Thanks to everyone who supported us in creating and piloting our lesson plans, including students, teachers, and members of Oregon State University's Global Environmental Change Organization. Bonneville Environmental Foundation provided funding for the development of *Act-mosphere: The Game of Choice* and *The Interspecies Climate Conference*.

<p>Energy Policies for a Cool Future (Lesson 9 Climate Change: Connections and Solutions)</p>	<p>Facing the Future</p>	<p>6 to 12</p>	<p>Calculate and compare the percentage of energy use and emissions by country to world average energy use and emissions, brainstorm impacts of energy use and sustainable energy solutions, develop a policy addressing global climate change, and present the policy at a mock "World Climate Change Summit."</p>	<p>Compare energy use and CO2 emissions per capita in developing countries and developed countries. Discuss energy impacts and suggest policies for addressing global climate change related to energy use at a "World Climate Change Summit"</p>	<p>1</p>	<p>1</p>	<p>1</p>	<p>1</p>	<p>1</p>	<p>1</p>	<p>1</p>	<p>1</p>	<p>1</p>
<p>International Climate Negotiations (Lesson 7)</p>	<p>Will Steger Foundation: Citizen Climate Curriculum</p>	<p>9 to 12</p>	<p>Summarize the different principles of equity in climate change decision-making, and predict which types of climate proposals might be most acceptable to different types of countries based on their unique situations.</p>	<p>Review equity principles, represent different country groups, and evaluate international climate agreements</p>	<p>1</p>	<p>1</p>	<p>1</p>	<p>1</p>	<p>1</p>	<p>1</p>	<p>1</p>	<p>1</p>	<p>1</p>
<p>Social Perspectives: Community Conversations</p>	<p>Wisconsin Department of Natural Resources: Climate Change</p>	<p>7 to 12</p>	<p>Recognize that climate change has many perspectives and no one solution, and understand how climate change may affect people differently.</p>	<p>Role-play and discuss perspectives of various Wisconsin community members using a "revolving conversation" format</p>	<p>1</p>	<p>1</p>	<p>1</p>	<p>1</p>	<p>1</p>	<p>1</p>	<p>1</p>	<p>1</p>	<p>1</p>
<p>Schools Take Charge: United Species Climate Conference</p>	<p>Cumulus Alliance for Bonneville Environment al Foundation</p>	<p>3 to 6</p>	<p>Learn about the various perspectives and potential effects of climate change on people, animals, and plants in different parts of the world through a role-playing exercise. Identify a solution by coming to a consensus with several of their peers, discuss issues of fairness, and consider students' ability to participate in the solution of a world-wide</p>	<p>Role-play as delegates (of varying species and origins) in a conference to consider the effects of climate change.</p>	<p>1</p>	<p>1</p>	<p>1</p>	<p>1</p>	<p>1</p>	<p>1</p>	<p>1</p>	<p>1</p>	<p>1</p>

Appendix I. United Species Climate Conference

Created by: J. Dauer, C. Lettero and M. Ocana

Activity Type: Role-play and Discussion

Overview: Students role-play as delegates (of varying species and origins) in a conference to consider the effects of climate change.

Goal: Students learn about the various perspectives and potential effects of climate change on people, animals, and plants in different parts of the world through a role-playing exercise. Students practice identifying a solution by coming to a consensus with several of their peers, discuss issues of fairness, and consider their ability to participate in the solution of a world-wide problem.

Subjects: Social Studies, English, Science,

Time: 30 to 40 minutes

Setting: Classroom

Materials: included - Delegate Roles

Key Vocabulary: fair share, carbon emissions, species, delegate, consensus, carbon dioxide

United Species Climate Conference Teacher Guide

- 1) Introduce key vocabulary words if necessary.
- 2) Introduce the activity (5 minutes)

“Welcome to the United Species Climate Conference. This is the first conference to bring together human and non-human participants to speak on behalf of their species. The main goal of the Conference is to make a worldwide recommendation about the fair share of carbon emissions for all of the 7 billion humans on the planet. The decision will be a number based on real numbers of the world nation’s pounds of carbon emitted per person per day. As a delegate to the Conference, you will meet with your group and reach a consensus about your worldwide recommendation, which means that everyone in your group will need to agree on the recommendation. At the end of the Conference, you will report back to the class about the consensus you reached.

Each of you will be assigned a role as a delegate in the Conference. Each role includes some background to help you imagine what it might be like to be that species. During the Conference, pretend to be your role. For example, if you are a salmon from Alaska, you will need to consider what will happen to your ocean and river habitat, your food, and your fish family if temperatures continue to rise.”

- 3) Set up the activity (5 minutes)
 - Write the Conference question on the board: “What is the fair share of carbon emissions (in pounds of carbon dioxide [CO₂]) per person per day?”
 - Write the estimated numbers of carbon emissions per person per day from fuel combustion in multiple countries on the board².

Country	Lbs CO ₂ emissions per person per day
United States	115
Mexico	25
Haiti	1.5
China	28
Australia	113
Germany	59
United Kingdom	52
Kenya	1.8
Kuwait	152
Japan	58

² Values obtained from the International Energy Agency for 2007. http://www.iea.org/co2highlights/http://en.wikipedia.org/wiki/List_of_countries_by_carbon_dioxide_emissions_per_capita

It’s interesting to note: a) since China has a large population, their per capita emissions are lower than other countries, despite their total emissions being much higher, b) Kuwait’s high emissions level is likely due to oil and gas development for export.

- Why do you think there are differences in carbon emissions per person between these countries?
- How are carbon emissions linked to lifestyle? Economy? Wealth? Technology use? Transportation? Energy sources? Consumption?
- Divide the class into groups of 7-9 students.
- Give each group a United Nations Climate Conference envelope and ask the students to pick a piece of paper from the envelope.

4) Convene the Conference (15-20 minutes)

- Students introduce themselves to the group by reading their card (e.g., “My name is Wanda Fisher, and I’m a Walrus from the Arctic Ocean”).
- The group discusses and debates the question (What is the fair share of carbon emissions (in pounds of carbon dioxide [CO₂]) per person per day?).
- The group reaches a consensus recommendation and selects a representative(s) who will report back to the class.
- Each group reports back to the class.

5) Discussion (10 minutes):

- i. How did you reach your group consensus?

Follow up questions:

- What were some of the things you considered?
- Did one person get his or her way?
- What arguments were the most convincing?
- Was it difficult or easy?

- ii. Leaders of countries from all over the world are coming together to discuss fair shares of emissions. For example, around 190 countries had delegates at the 2009 United Nations Climate Change Conference in Copenhagen to discuss climate change. What challenges stand in the way of reaching a consensus?

Prompts for responses may include:

- People in some countries might have to make bigger changes to the ways they are living than those in other countries.

- Some countries make a lot of money from fossil fuels (e.g., coal miner in West Virginia and oil refiner in Venezuela).
- iii. Should non-human animals and plants be considered in these discussions? Who will speak for them?
- iv. We live in a big world, and climate change is a big problem. Why do you think individual actions matter in the context of such a big problem?

Some ideas include:

- **Speed:** We can make immediate reductions to our emissions, whereas industries and countries are really slow to change.
 - **Integrity:** If something is important to us (like walrus or crops) then we have to act in a way that protects those things.
 - **Inspiration:** By making low-carbon decisions, we can inspire and teach other people about how to lower their carbon emissions.
 - **Community:** Reducing your own energy use can strengthen the collective movement and consciousness that values whole communities of animals and plants.
- 6) Take a moment to write down what you think the most important reason is to reduce emissions. Considering those reasons, how might they motivate you to make changes in your life?

United Species Climate Conference: Delegate Roles

Print a set of these roles for each group of students. Cut up the roles on the lines and place each set into envelopes.

Raya or Rafah Nasheed (a school teacher the Maldives)

I teach fourth grade in the most beautiful country on earth. The Maldives islands make up the smallest Asian country in both population and area. On average it is 4 feet 11 inches above sea level, and it is the lowest country on the planet. Over the last century, sea levels have risen about 8 inches, and further rises of the ocean could threaten the existence of Maldives.

Elizabeth or Ricardo Giovanni (a farmer in Italy)

I have an olive tree plantation in Italy, a country very vulnerable to climate change. If temperatures continue to increase, Italian farmers will struggle to keep crops alive because of lack of rain. The lack of rain will also affect using water for energy (hydropower). Rise in temperatures is also projected to increase health risks from heat waves and wildfires.

Wanda or Wally Fisher (a walrus calf from the Arctic Ocean)

I am a baby walrus calf. Walrus need ice to give birth and to rest on. Arctic ice depth has reached unusually low levels in several recent years. Thinner ice has reduced the amount of resting habitat for mother walruses near feeding grounds. This makes it difficult for my family to stay together.

Petrina or Peter Hawthorn (a coal mine owner in West Virginia)

My family has been mining coal since the 1880s. The work has been hard, but I've been able to provide a good life for my family, and most of my town depends on coal mining jobs. I know burning coal results in negative effects on the environment including releasing greenhouse gases. I worry about these things, but I don't how my town would survive without the mine.

Hanna or Hank White (a coral in Australia's Great Barrier Reef)

The Great Barrier Reef is the largest reef system on the planet. As a coral, I am sensitive to changes in sea temperatures and acidity. If sea temperatures continue to rise, it will be very hard for me to survive. The coral reefs provide habitat for fish and breeding grounds for many animals including seabirds and whales. Many other animals will be negatively affected if the reef is harmed.

Judy or Jed Turner (a truck driver from California)

I have been driving a truck from California to Washington State for 15 years. I usually carry fruit, like oranges. I work long hours, but I love the open road and the independence of driving a truck. I know my truck emits a lot of carbon dioxide during the year, but I also know that everyone depends on my deliveries. Besides, this is the only job I've ever had, and I don't know what else I would do.

Maria or Martin Gonzalez (a manager of an oil refinery in Venezuela)

I worked hard to study engineering in school, and I was lucky to get a high paying job as the manager of an oil refinery. At the refinery, crude oil is processed and refined into gasoline and heating oil. I know the refinery is responsible for a lot of carbon emissions, but there is a really high demand for these products, so this industry is really important to Venezuela's economy.

Abby or Arby Sap (a sugar maple tree in New England)

I am a sugar maple that will live to be 300 years old. I stay where I sprouted, but my seeds can travel 600 feet on a windy day. People collect my sap to make maple syrup, but without frost the sap doesn't flow. I know other trees that are not growing well because of pollution, insects and warmer climate.

Rosa or Ray Wing (a butterfly in Canada)

I am a monarch butterfly that makes an amazing migration from Canada to Mexico. My unique migratory cycle will be affected by changing climate. Changes in temperature may make my resting sites unsuitable. Changing precipitation might affect my delicate wings and make it difficult to fly.

Appendix II. Carbo—NOOOO! Obstacle Course

Created by: J. Dauer, C. Lettero and M. Ocana

Summary: While working in teams to run through an obstacle course, each student stops at four stations (water, transportation, food, and energy) and makes choices that affect his or her personal carbon footprint, which in turn affect their team's carbon footprint. To help students visualize their carbon footprints, "carbon blocks" (represented by large foam scraps) are placed along the obstacle course as students make choices at each station. The carbon blocks create barriers for subsequent teammates who run the course.

Students are incentivized in two contrasting ways: 1) a group incentive to reduce carbon emissions is created by penalizing students for carbon blocks that they step on, 2) an individual incentive to choose high-carbon choices is created because low-carbon choices at each station are more difficult and take more time to complete.

After teams complete the obstacle course, students participate in a group discussion that links everyday choices to carbon/greenhouse gas emissions, examines the effect of one person's emissions on all people, and considers the ethical dimensions of how decisions affect individuals and the group.



Activity Type: Active obstacle course

Learning Goals:

By running the obstacle course, participants will discover how their everyday choices can affect greenhouse gas (GHG) emissions (especially carbon dioxide). They will discuss the effects of one person's emissions on all people and whether decisions to lower personal GHG emissions may lead to other benefits (less expenses, easier) or may require

sacrifices (take longer, be more expensive) and what efforts are required to make decisions about personal GHG emissions

Subjects: Earth science, Social Science, Biology

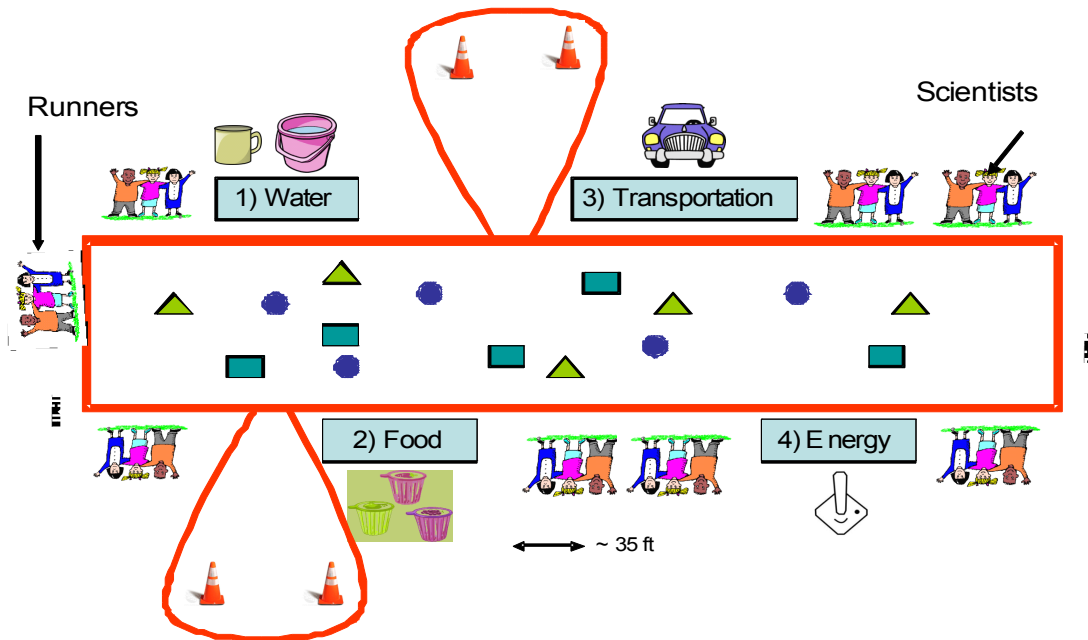
Time: 1 hour total

Setting: In a large, open space inside or outside

Materials: Described by sections below

Carbo—NOOOO! Obstacle Course Teacher Guide

Course:



Participants:

- **Facilitators:** Instructors who are familiar with the learning objectives, rules, and discussion points of the obstacle course.
- **Runners:** Participants who run through the obstacle course.
- **Scientists:** Participants who stand on the outside of the course and watch the runners. Scientists observe the runners and record data about the runners. Each group of scientists should identify at least two recorders.
- **Observers:** Observers line the course and assist the Scientists.

Rules

1. **Carbon:** The activities at each station result in the release carbon dioxide, which is represented by “carbon blocks” that are placed on the obstacle course. The number of carbon block corresponds to how carbon-intensive the activity is (e.g., choosing to ride a bike at the transportation station results in 1

Material Suggestions: Carbon blocks, ideally, should be soft yet heavy enough to throw. Ask your local upholsterer or furniture store for scraps of foam. You could also use pieces of old yoga mats, cork board, or carpet samples. If unable to find these items, recycled paper is also an option.

- carbon block, but driving a car results in 5 carbon blocks). The carbon blocks would ideally be color-coded for each station (e.g. transportation = red). **These blocks stay on the course while an entire group of runners complete the course.** The blocks are removed when the course is reset for the next set of runners. Depending on the participants' age, facilitators may choose to be the ones to place the blocks in the course, or allow scientists at each station to place the blocks.
- Groups:** 2-4 facilitators divide the class into groups of 4-5 students. Each group takes turns being runners and scientists. To begin, designate 1 group as runners and other groups as scientists. Remaining students, in the third or fourth groups, be observers who line the course and help scientists. One student may be asked to be a "flagger" who starts runners on the course.
 - Runners:** The goal of the runners is to complete the obstacle course without stepping on carbon blocks. Runners take their place at the start line, and each member of the group runs the course separately. Runners must wait for the go-ahead from a flagger and will be separated by 30 seconds to 1 minute. Runners get through the course by completing the activity at each of the four stations.

Suggestion: For older participants who need more rounds with more complexity, a point system could be added to represent how less carbon intensive options may (or may not) lead to saving money, being healthier, and conserving other resources for the future.
 - Scientists:** The goal of the scientists is to collect precise, accurate data about the runners. From the sidelines, the scientists and other observers collect data about the number of penalties per runner. After each group goes, the scientists count the number of carbon blocks on the course and help reset the course. The role of scientists can be expanded to record: the number of steps taken by a runner (with a pedometer), the amount of time each runner takes, the choices a runner makes, the amount of carbon associated with each choice at each station via color coded carbon blocks, etc.
 - Penalties:** If a runner steps on a carbon block or goes out of bounds, one of the scientists or observers raises a hand until noted by the scientists. The recorder tallies these penalties for each runner and the total for all runners in a group.

Activities/Stations

Below, we describe an example activity, suggested numbers of carbon blocks for actions, and materials for each station. You may vary the activities to fit the needs, ages, and interests of your group. **Good activities will** 1) relate to everyday life, 2) require easy-to-obtain materials, 3) lead to post-activity discussion questions (see below), and 4) last about 20 seconds.

○ **Water**

Activity: The runner must clean a dirty mug in a bucket of water.

Choice: Use 1) a small bucket (1-2 blocks), or 2) a large bucket (5-6 blocks).

Materials: Two sizes of buckets filled with water, bucket of sand, clean mug. Facilitators dip the mug in the sand to re-dirty it before each runner goes by.

○ **Food**

Activity: The runner packs a lunch and runs with it around the cones.

Choice: Pack a lunch in 1) a paper bag with pre-packaged food (5-6 blocks), or 2) a re-useable lunch box with a re-useable mug, whole fruit, and a sandwich in tupperware (1-2 blocks).

Materials: Packaged food (e.g., drink box, crackers, plastic silverware, etc), paper lunch bag, lunch box, reusable cup, local food (e.g., fruit and vegetables)

Other Options: The runner must walk through the course while balancing some food on a spoon. Food variations for the choice could be food that's packaged vs. unpackaged, local vs. far away, processed vs. whole food, paper vs. plastic vs. reusable or reusable water bottle vs. aluminum can vs. disposable plastic.

○ **Transportation**

Activity: The runner runs around the cones carrying a transportation choice simulating getting to school.

Choice: 1) Run between the two points with a toy car (5-6 blocks), 2) walk the course carrying a toy bicycle (1-2 blocks), or 3) run the course twice with a toy helicopter (10 blocks).

Materials: a toy car, bike, and helicopter.

○ **Energy**

Activity: Play time. The runner chooses something to play with.

Choice: 1) Electric game (5-6 blocks) (a simple gadget that uses batteries or electricity that requires the runner to do something akin to a quick computer or video game) or 2) game that is not electric like a basketball and hoop or jump rope (1-2 blocks).

Materials: electric and non-electric games.

Set up:

To make the course, measure an area approximately 20 ft long and 4 ft wide. This will serve as the main part of the course. Extend sections of the course out to provide room for participants to run during the transportation and food stations. Use small cones to provide markers for the course, and then line the course using masking tape or another material

that can be re-used (yarn, old garland, etc.). Chairs or small tables can be used at each station to hold the materials. Draw a start and finish line, and include a flag for the flagger to wave. If the obstacle course is outside, provide a small board for the scientists to collect their data.

Facilitation

Introduction: In order to let the students think and discover on their own, the allegory of the game is not explained at first. But it's important to begin to preface the game for participants. For example: "Today we're going to play a game that involves you running an obstacle course. However, this obstacle course has some connections to real life. Look for the connections while we play, and then we'll talk more about what those links are to what we do every day."

Explain the game: One facilitator runs the course while participants stand around the course and watch. Explain that the object of the game is to finish all the tasks and get to the end of the course as quickly as you can without stepping out of bounds and without stepping on carbon blocks.

Suggestion: You may want to establish a signal that allows the participants to know when they should transition from cheering on the course to listening carefully to directions and discussion. You can practice with a signal (whistle/bell/kazoo), by having the participants jump around and make noise, then freeze and be quiet when they hear the signal. Explain that they are allowed to have fun and be noisy and active, but they also must be attentive and allow leaders and other participants to speak.

Explain: "Now here is a very important thing. Sometimes in life, our actions cause things to happen that we may not be very aware of. In fact, these things may be totally invisible. **What are some things that are real, but you can't see it?** Sometimes these things may affect you and other people (like those in your group) and they may affect the environment. During the action at each of these stations, the leaders will make these invisible things become visible. Like this..." Demonstrate release of carbon blocks. "Now, when each person goes on the course, if you step on a piece of a block, you get a penalty tallied on the board."

Explain that the carbon blocks will stay on the course while the entire group of 4-5 runners completes the course. (Note: Especially for younger participants, you may want to discuss or mention the idea that this may not be fair for individuals and that this is part of the game. Participants can pay attention to how this makes them feel, and this will be discussed after the game. Suggesting that the game may not be fair might help avoid some participants' frustration when they experience the unfairness and allow them to be objective about their feelings.)

Assign a participant to be the flagger at the start line,, scientists, 1-2 scientists who records, and any other jobs. Explain to the other participants that they should act as observers and cheerers along the course.

1) Practice round:

Explain the type of data that will be collected by the scientists. Set up a scoreboard for the scientists. You may choose to have two students volunteer to run the course as a practice round for the scientists who are collecting the data. Explain the groups will run the course for one round and then we will stop and talk more about the course before a second round. (If you have many groups and limited time, you may want to have 1-2 groups be “First round, no choices” and subsequent groups be “Second round, add choices to the course.”

	Round 1- No choices		Round 2-Choices added to the course	
	# of penalties	# of carbon blocks	# of penalties	# of carbon blocks
Group 1				
Group 2				
Group 3				

Example table for collecting data on the number of penalties and the number of carbon blocks for each of three groups during two rounds. Data tables used for the obstacle course may vary depending on number of people, type of data collected, and number of rounds.

2) First round, no choices:

One or two groups of 4-6 participants run the obstacle course. There will be only one way to do the activity at each station, which will be the most carbon-intensive option. This will result in many carbon blocks on the course and will likely increase the number of penalties and the number of carbon blocks of all the groups as they navigate around the carbon blocks.

Scientists: While a group is running the course, scientists make a tally of penalties from all the runners within the group. After the course has been completed by a group, the scientists will pick up the carbon blocks and count each piece. If the stations on the course have color coded carbon blocks, they could determine the number of carbon blocks per station.

First Round Discussion Questions:

- What might the blocks represent?
- What is a greenhouse gas?
- What is carbon dioxide?
- Where do greenhouse gases and carbon dioxide come from?
- How is carbon dioxide connected to the actions at each station?
- How does extra carbon dioxide affect the Earth?
- Has anyone heard of climate change? What does it mean?
- How did it make you feel to see so many carbon blocks on the course?
- How did it make you feel to run the course if you were last in your group?

3) Second round, add choices to the course:

For this round, choices will be added to the course, so that there will be at least two options at each station. This should reduce the number of carbon blocks as well as penalties on the course. Explain: "Now we're going to re-set the course for the next group to run it. BUT! Before the next group goes on the obstacle course, let's make this a bit more like real life. There is something else that every single person in this world has that is very, very important. Can anyone think of what that is? CHOICES!" (Ah-ha.) Now act out the course explaining the choice at each station. Tell the participants to observe closely what happens when different choices are made.

Second Round Discussion Questions:

Greenhouse gases are primarily produced by fossil fuel emissions and these emissions cause global warming and climate change.

- What are fossil fuels?
- What powers a car?
- What powers the electricity in your house?
- How does the energy we use related to climate change?
- How will we be affected by climate change?
- How will trees/glaciers/weather/farming be affected by climate change?

Small group/team

discussion: The obstacle course doesn't seem fair because those who go first impact those who go later. If the group decides to work together, and those who go first are cooperative by choosing the less carbon intensive options, then it will be easier for everyone to get through the course.

Concepts to address throughout:

1. Fossil fuels that we use for many things put carbon dioxide into the atmosphere.
2. Carbon dioxide in the atmosphere heats the Earth and causes imbalances in natural processes.
3. We use fossil fuels all the time, even if it is indirectly by wasting food, buying lots of new clothes, taking long hot showers, etc.
4. There are many ways to decrease the use of fossil fuels.

- What do the scientists' data tell us about the relationship between carbon blocks and penalties? How did the first round without choices compare to the second round with choices?
- Did you think the obstacle course was fair for everyone? Why not?
- What would need to happen to be sure everyone can go through the course quickly and without penalty?
- What would happen to each group every time if there were no choices?
- What would happen if there were choices, but every individual chose an option that created a lot of carbon blocks?
- Who has the most responsibility during the obstacle course?
- How might this be like greenhouse gases and climate change?

4) Further Discussion

Lead the students in a more detailed discussion of how they can reduce their impact on global warming by activities in everyday life. “There are lots of things that we can do to reduce our carbon emissions. But these things often require commitment and persistence. Let’s talk about those things using the obstacle course as an example.”

Leading questions for understanding the obstacle course:

Water

- What does water have to do with global warming? (It takes energy to move, clean, heat and store water. Water might be more or less available in a warming future.)
- How can you reduce the amount of water you use?
 - Do you turn the water off while you brush your teeth?
 - How much time do you spend in the shower?
 - What time of day do you help your parents water the plants in the garden?

Food

- In what ways do your food choices affect global climate change?
- How did your food get to you? What resources may have been used to transport your food to your city?
- Can you think of what resources are required to grow your favorite veggies and fruits or what resources are essential for the production of your favorite meats?
- How often do you eat everything on your plate?
- What about all the packaging of the foods you eat (the plastic wrappers, cardboard boxes, Styrofoam, etc.)?

Transportation

- How does your choice of transportation (to and from school, summer camp, and your friends’ houses) affect Earth’s climate?
- What kinds of transportation have the greatest and least impact on global warming?
- Why doesn’t everyone always walk or ride a bike?
- Do you ride your bike or walk even when it is raining outside? Do you complain if you do?
- What can you do in your everyday life to reduce the impact carbon emissions from transportations?

Electricity

- How does the amount of electricity used at someone’s house affect global climate?
- How is the energy created that is used to power your home?
- What can you do in your own home to reduce the use of electricity?
- Do you always turn the lights off when you leave a room or turn your computer off when you are done using it?
- How much time do you spend using electrical gadgets compared to the time you spend reading or playing outside?

Extension Activity:

Facilitators could go one step farther and link the number of carbon blocks to actual numbers. For example, 1 carbon block equals 1 ton of carbon dioxide (CO₂) per year. Participants could calculate the tons of CO₂ emitted per person per year under different scenarios and compare those calculations to actual country or state per capita carbon emissions. For example:

Country	Metric tons of CO₂ per person per year
Average World Citizen	4.5
U.S.	18.9
Germany	9.6
Haiti	0.2
China	4.9

Tons of CO₂ emitted per person (capita) by country can be found on this website:
http://en.wikipedia.org/wiki/List_of_countries_by_carbon_dioxide_emissions_per_capita

Tons of CO₂ emitted per person (capita) by states can be found on this website:
<http://climateprogress.org/2008/10/24/interactive-map-co2-emissions-by-state-per-capita/>

Questions to explore in class discussion or as a writing-response exercise:

- What factors contribute to different per capita carbon emissions levels in each state or country? (industrial development, population size, technology use, transportation, energy sources, consumption, etc.)
- Why do you think your state's per capita carbon emissions are higher or lower than the national average?
- Why do you think the US average of emissions per person per day is so much higher than the average world citizen?
- Should we be concerned about decreasing our carbon emissions?
- Whose responsibility is it to reduce our carbon emissions? (Federal, state or local governments? Industry and corporations? Individuals?)
- We can think of a healthy atmosphere as a natural resource and worldwide carbon emissions as something to be allocated. What do you think a fair share of per capita emissions in the US should be? What do you think a fair share of per capita emissions is for a world citizen? Are these two numbers different? Why or why not?

- If we determine a worldwide fair-share of per capita emissions, should there be exceptions to this rule? What should these exceptions be?
- How would your life be different if you were living within your fair share of worldwide carbon emissions?

Appendix III. Act-mosphere: The Game of Choice

Created by: J. Dauer, C. Lettero and M. Ocana

Summary: In this board game, the goal is for students to be the first to reach the finish without depleting the “carbon emissions” from the communal pool. Students take turns picking a “choice card” that presents one high- and one low-carbon emission behavior to choose from. Students who choose the high-carbon emission behavior advance farther on the board and use up more carbon emissions than those who choose a low-carbon emission behavior. Once one player reaches the finish line, the game ends. During the course of the game, if the carbon emissions become depleted, the game immediately ends and all players return to the start-line. This encourages students to consider individual and group perspectives when using a limited resource: carbon emissions. After the board game, students participate in a group discussion that links everyday choices to carbon/greenhouse gas emissions, frames the greenhouse gas emission issue in the context of individuals and groups, and consider the ethical dimensions of the problem on a world-wide stage.

Activity Type: Board Game

Overview: Students consider the carbon emissions and greenhouse emissions associated with their daily choices.

Learning Goals: Students experience the conflict between the individual and group perspectives and motivations that occurs when a resource is limited. They frame the greenhouse gas-emission issue in the context of groups and individuals, and consider the ethics of the problem on a worldwide scale.

Subjects: Earth science, Math

Time: 1 hour total (15 minutes for recommended explanation of climate science background and game explanation, 25-30 minutes to play the game, 15 minutes for discussion).

Setting: Classroom

Materials:

- **Included:** Game Board, Action Cards.
- **Not included:** Team container (one per team; e.g., plastic or glass jar), emissions pieces (e.g., dry beans), team playing pieces (e.g., decorated bottle caps), individual and group incentives (e.g., a class privilege, extra credit points, small prize, candy, or cookies).



Act-mosphere: The Game of Choice Teacher Guide

The objectives of the board game are to:

- Create tension between interest of the individual and the interest of the group
- Cause students to think about the consequences of individual choices in a context that is greater than an individual

Player Goals

The players of the board game have team and individual goals:

- As a team, the players' goals are to make sure the team does not run out of carbon emissions.
- As individuals, each player's goal is to win the game by making it to finish first.

Board Game Pieces

- **Game Board**
- **Team Container**
- **Player Pieces**
- **Carbon Emissions**
- **Action Cards:** There are three types of Action Cards:
 1. **Decision:** Each card lists two actions for the player to choose between. The player's choice determines the number of spaces s/he moves forward and the number of carbon emissions that s/he must spend from the team's container, as listed on the card. Decision cards are divided into 4 categories: Household, Waste, Transportation, and Food.
 2. **Bonus:** Each card allows a player to move forward without spending carbon emissions. Some bonuses allow players to remove carbon emissions from the team container.
 3. **Penalty:** Each card requires a player to move backwards and spend carbon emissions from the team container.

Board Game Instructions

- The class is divided into groups of 5 players.

- Each group received the following: one game board, one team container with 25 carbon emission pieces, one player piece per person, and a set of Action Cards.
- The object of the game is to move the player pieces from start to finish. However, the game is a bit more complicated and has two things that are especially similar to the real world: *choices* and *consequences*.
 - **Choices:** The first player (Player 1) gets to make a choice. The player on his/her left (Player 2) picks up an Action Card and reads the “CHOICE” side to Player 1. Player 1 then announces to the group which choice s/he is going to make.

For example: Player 2 reads "HOUSEHOLD CHOICE” Take a 5 minute shower OR Take a 10 minute shower. Player 1 announces that s/he is going to "Take a 5 minute shower."
 - **Consequences:** After Player 1 makes a choice, Player 2 reads the back of the Action Card, which explains how far Player 1 moves on the board for the choice made and how many carbon emissions Player 1 spent. Player 1 then moved ahead on the board and spends his or her emissions by placing them in the team container. Once the carbon emissions are in the team container they can no longer be used for the game.

For example, Player 2 reads "YOUR MOVE 5 minute shower: Move 2 spaces, spend 2 carbon emissions." Therefore, Player 1 moves two spaces and puts two emissions into the pool.
- The Action Cards have a high-carbon choice (one that uses more energy) and a low-carbon choice (one that uses less energy). If a high-carbon choice is made, the player moves farther on the board and spends more emissions. If a low-carbon choice is made, the player moves less on the board, and spends fewer emissions.
- Players do not need to answer the choices according to their own lifestyle, instead they may choose either high or low carbon actions to see what the results of their actions would be.
- There are two ways to end the game:
 - **Scenario 1:** A player crosses the finish line and there are carbon emissions remaining that have not been spent by the group. In the case of Scenario 1, the player crossing the line first gets an "individual incentive" and every player in the group including the finisher gets a "group incentive."

- **Scenario 2:** The group spends all of its carbon emissions. In the case of Scenario 2, the game resets, no one gets a reward, and all players return to Start.
- The players may play as many times as they like until they achieve Scenario 1, or until the class runs out of time.

After Game Discussion

- What did you learn?
- How would you play differently if you wanted to finish first versus wanted the entire group to win (not run out of emissions)?
- Which two perspectives are at play in the game? (The rules of the game create tension between individual and group goals.) How is this like decisions about the environment and energy/carbon consumption? How might an individual perspective contribute to the problem of greenhouse gas emissions?
- Our daily activities directly relate to carbon emissions. If everyone in the world made the same decisions that your group did, what would the end result be for the environment?
- Carbon emissions are limited resources, do you think this motivates or deters individuals from using up more of the resource? Why? Do you think all people respond in the same way? Why or why not?
- What factors played into the decisions you made about daily activities? How is this like real life? Do you think it will be easy for people to change behaviors to reduce carbon emissions? What are some of the factors that stand in the way of making changes?
- Is the game fair for everyone? How do we decide who gets to use carbon emission resources? (You could mention that countries in international negotiations about climate change are dealing with the same fairness issues regarding carbon emissions).

Extension Suggestions:

- Write a 1-3 paragraph response to the activity either in class for ten minutes, or as a homework assignment. Use 1-3 of the discussion questions as a basis for the response.

- The relative emissions listed on cards are all estimates as a conceptual learning tool because it is difficult to take into account all the contributions of carbon emissions for any single action. The difficulty in estimating individual emissions may be an important lesson for students to learn as well. Ask students to keep the cards they used for each choice they made during the game. These cards can be used for further discussion activities, such as comparisons among the impact of various activities, ideas for behavior change, listing of trade-offs among choices, or personal emissions calculations.
- Listen to a 20-minute podcast from National Public Radio's Planet Money called "Fixing Climate Change is Going to Cost You."
http://www.npr.org/blogs/money/2009/11/podcast_fixing_the_climate_cha.html
- Read one of the scientific papers below and discuss it with your class.

Inman, M. 2009. "The Climate Change Game," *Nature Reports*
<http://www.nature.com/climate/2009/0911/full/climate.2009.112.html>

Dreber, A . & Nowak, M. 2008. "Gambling for global goods," *Proceedings of the National Academies of the Sciences*, 105:2261-2262.
<http://www.pnas.org/content/105/7/2261.full>

Materials for use with Lesson Plan 3 Act-mosphere

The first pages include the Action Cards used in the board game. They can be copied and cut into segments (lines represents the appropriate place to separate cards and each page will be printed double-sided so that Choices are on the front and Your Move is on the back). The last page includes a basic game board that can be easily printed and pasted to paperboard or cardboard.

ACTION CARDS

FOOD CHOICE

Buy individually wrapped chocolates.

OR

Buy chocolates from the bulk aisle.

YOUR MOVE

Individually wrapped: Move 3 spaces, spend 3 carbon emissions.

Bulk aisle: Move 1 space, spend 1 carbon emission.

Did you know the average US resident produces 1,879 pounds carbon dioxide equivalent in landfill waste per year?

FOOD CHOICE

Eat steak for dinner.

OR

Eat chicken for dinner.

YOUR MOVE

Steak: Move 4 spaces, spend 4 carbon emissions.

Chicken: Move 2 spaces, spend 2 carbon emissions.

Did you know that although beef accounts for just 30% of world's meat consumption, it contributes 78% of greenhouse gas emissions from meat?

FOOD CHOICE

Eat food grown with chemical fertilizers.

OR

Eat food grown with compost.

YOUR MOVE

Chemical fertilizers: Move 2 spaces, spend 2 carbon emissions.

Compost: Move 1 space, spend 1 carbon emission.

Did you know that chemical fertilizer use accounts for 2-3% of **total global** greenhouse gas emissions?

FOOD CHOICE

Eat tomatoes from your neighbor's garden.

OR

Eat tomatoes from Mexico.

YOUR MOVE

Neighbor's garden: Move 1 space, spend 1 carbon emission.

Mexico: Move 3 spaces, spend 3 carbon emissions.

Did you know that tomatoes shipped from Mexico to California by truck emit 2,630 lbs of greenhouse gas emissions every year?

FOOD CHOICE

Eat a carnivore diet.

OR

Eat a vegetarian diet.

YOUR MOVE

Carnivore: Move 4 spaces, spend 4 carbon emissions.

Vegetarian: Move 1 space, spend 1 carbon emission.

Did you know that vegetarian diets result in 1,231 lbs carbon dioxide per month, but carnivore diets have 5.5 times higher carbon dioxide emissions?

HOUSEHOLD CHOICE

Take a 5 minute shower.

OR

Take a 10 minute shower.

YOUR MOVE

5 minute shower: Move 2 spaces, spend 2 carbon emissions.

10 minutes shower: Move 4 spaces, spend 4 carbon emissions.

TRANSPORTATION CHOICE

Your class is taking a trip to the History Museum and stopping to see the biggest ball of string in the world!

Take the bus on your trip.

OR

Take the train on your trip.

YOUR MOVE

Bus: Move 2 spaces, spend 2 carbon emissions.

Train: Move 1 space, spend 1 carbon emission.

FOOD CHOICE

Buy the least expensive food.

OR

Buy foods grown organically (without pesticides).

YOUR MOVE

Less expensive food: Move 3 spaces, spend 2 carbon emissions.

Organic food: Move 1 space, spend 2 carbon emissions.

Did you know that as much as 40% of the energy used to grow food goes towards chemical fertilizers & pesticides?

TRANSPORTATION CHOICE

Your whole family is planning a summer trip to the beach!

Take a plane.

OR

Take a train.

YOUR MOVE

Plane: Move 4 spaces, spend 4 carbon emissions.

Train: Move 2 spaces, spend 2 carbon emissions.

FOOD CHOICE

Buy one quart of yogurt.

OR

Buy six smaller individual yogurt containers.

YOUR MOVE

One quart: Move 1 space, spend 1 carbon emission.

Six small containers: Move 2 spaces, spend 2 carbon emissions.

FOOD CHOICE

Eat blueberries shipped to the store.

OR

Eat local blueberries you picked yourself.

YOUR MOVE

Shipped berries: Move 1 space, spend 1 carbon emission.

Local berries: Move 2 spaces, spend 2 carbon emissions.

HOUSEHOLD CHOICE

Turn up the heat when you are cold.

OR

Put on a sweater when you are cold

YOUR MOVE

Turn up heat: Move 4 spaces, spend 4 carbon emissions.

Put on sweater: Move 1 space, spend 1 carbon emission.

Did you know you can save 3% of household energy emissions just by turning down the thermostat 3°F during the day?

FOOD CHOICE

Put only what you can eat on your plate and lick it clean.

OR

Overload your plate and throw away the scraps.

YOUR MOVE

Clean plate: Move 1 space, spend 1 carbon emission

Food Scraps Leftover: Move 3 spaces, spend 3 carbon emissions.

HOUSEHOLD CHOICE

Leave the lights on while you are at school.

OR

Turn off all the lights in the house before going to school.

YOUR MOVE

Light on: Move 4 spaces, spend 4 carbon emissions.

Lights off: Move 2 spaces, spend 2 carbon emissions.

Did you know that lighting is 6% of home energy use?

HOUSEHOLD CHOICE

Open the refrigerator lots of times while looking for snacks.

OR

Make one quick trip to the refrigerator to find a snack.

YOUR MOVE

Lots of refrigerator trips: Move 2 spaces, spend 2 carbon emissions.

One refrigerator trip: Move 1 space, spend 1 carbon emission.

Did you know refrigerators and freezers account for 59 lbs of carbon dioxide emissions per month?

HOUSEHOLD CHOICE

Leave in your incandescent light bulbs.

OR

Replace your light bulbs with compact fluorescents (CFL).

YOUR MOVE

Incandescents: Move 4 spaces, spend 4 carbon emissions.

CFLs: Move 2 spaces, spend 2 carbon emissions.

Did you know using one incandescent bulb creates about 100 lbs carbon dioxide emissions per month, but a CFL bulb only creates $\frac{1}{4}$ of those emissions?

HOUSEHOLD CHOICE

Watch TV.

OR

Play outside.

YOUR MOVE

Watch TV: Move 2 spaces, spend 2 carbon emissions.

Play outside: Move 1 space, spend 1 carbon emission.

Did you know 25% fewer hours of TV each day result in a household decrease in energy emissions of 1%?

WASTE CHOICE

Use a paper towel to dry your hands.

OR

Air-dry your hands.

YOUR MOVE

Paper Towel: Move 3 spaces, spend 3 carbon emissions.

Air dry: Move 1 space, spend 1 carbon emissions.

Did you know that electric dryers are twice as energy-efficient as paper towels, even towels made from recycled paper?

HOUSEHOLD CHOICE

Dry your clothes in a drying machine.

OR

Dry your clothes using a drying line.

YOUR MOVE

Drying Machine: Move 3 spaces, spend 3 carbon emissions.

Line Dry: Move 1 space, spend 1 carbon emission.

Did you know you can save 15 lbs carbon dioxide emissions per month by line drying your clothes?

WASTE CHOICE

Bring cloth bags to the grocery store.

OR

Use plastic grocery bags at the grocery store.

YOUR MOVE

Cloth bags: Move 1 space, spend 1 carbon emission.

Plastic bags: Move 2 spaces, spend 2 carbon emissions.

Did you know that 2.2 lbs of carbon dioxide are generated per 5 plastic bags?

HOUSEHOLD CHOICE

Unplug computers and electronics.

OR

Assume someone else will unplug them for you.

YOUR MOVE

Unplug: Move 1 space, spend 1 carbon emission.

Assume someone else will do it: Move 2 spaces, spend 2 carbon emissions.

Did you know powered up computers can account for 8 lbs of carbon dioxide per month?

WASTE CHOICE

Print your 25-page report double-sided on paper.

OR

Print your 25-page report single-sided on paper.

YOUR MOVE

Double-sided: Move 1 space, spend 1 carbon emission.

Single sided: Move 2 spaces, spend 2 carbon emissions.

Did you know that manufacturing one pound of printer paper produces 4 pounds of carbon dioxide emissions?

HOUSEHOLD CHOICE

Turn on the air conditioner.

OR

Turn on the ceiling fan.

YOUR MOVE

Air conditioner: Move 3 spaces, spend 3 carbon emissions.

Fan: Move 1 space, spend 1 carbon emission.

Did you know that air conditioners use 15-30 times more carbon dioxide emissions than ceiling fans?

WASTE CHOICE

Cloth napkin.

OR

Paper napkin.

YOUR MOVE

Cloth napkin: Move 1 space, spend 1 carbon emission.

Paper napkin: Move 2 spaces, spend 2 carbon emissions.

WASTE CHOICE

Recycle your soda can.

OR

Throw away your soda can.

YOUR MOVE

Recycle: Move 1 space, spend 1 carbon emissions.

Throw Away: Move 3 spaces, spend 3 carbon emissions.

Did you know that throwing away one aluminum can wastes as much energy as if that can were 1/2 full of gasoline?

WASTE CHOICE

Recycle your plastic yogurt container.

OR

Turn your plastic yogurt container into a planter.

YOUR MOVE

Recycle: Move 2 spaces, spend 2 carbon emissions.

Reuse: Move 1 space, spend 1 carbon emission.

Did you know that it takes energy to transport, process, and introduce recycled materials back into the marketplace?

PENALTY

You forgot to bring your water bottle and had to buy a plastic bottle!

YOUR MOVE

Move back 1 space and put 1 carbon emission into the pool.

WASTE CHOICE

Buy a new magazine.

OR

Borrow a magazine that your friend was reading.

YOUR MOVE

Buy new: Move 3 spaces, spend 3 carbon emissions.

Borrow: Move 1 space, spend 1 carbon emission.

Did you know that an average copy of *Time* magazine causes about 0.3 pounds of carbon dioxide emissions?

BONUS

You wrapped your brother's birthday gift in homemade, hand-decorated paper from a grocery bag. He loved it!

YOUR MOVE

Move forward 2 spaces without using any carbon emissions.

WASTE CHOICE

Buy a newspaper.

OR

Read the newspaper online.

YOUR MOVE

Buy a newspaper: Move 3 spaces, spend 3 carbon emissions.

Read a newspaper online: Move 1 space, spend 1 carbon emission.

Did you know that an average newspaper produces 6 pounds of carbon dioxide?

PENALTY

You forgot about that bag of lettuce in the refrigerator and it rotted!

YOUR MOVE

Move back 1 space and put 1 carbon emission into the pool.

WASTE CHOICE

Find ways to **reuse** your milk jug – turn it into a parking garage for your little brother’s toy cars!

OR

Throw away your milk jug.

YOUR MOVE

Throw away: Move 2 spaces, spend 2 carbon emissions.

Reuse: Move 1 space, spend 1 carbon emission.

BONUS

You start a garbage-free day at school and reduce the amount of waste people throw away by 75%!

YOUR MOVE

Move forward 4 spaces without using any carbon emissions.

TRANSPORTATION CHOICE

Walk to school.

OR

Ask for a ride to school from your mom.

YOUR MOVE

Walk: Move 1 space, spend 1 carbon emissions

Drive: Move 3 spaces, spend 3 carbon emissions.

TRANSPORTATION CHOICE

Car-pool to school with four people.

OR

Drive to school with your dad.

YOUR MOVE

Carpool: Move 1 space, spend 1 carbon emission.

Drive with dad: Move 3 spaces, spend 3 carbon emissions.

BONUS

Plant a native tree!

YOUR MOVE

Take 4 carbon emissions out of the pool for the team to reuse. Move 4 spaces.

Did you know? There is the same amount of carbon in a tree as in one tank of gasoline!

BONUS

Write a letter to your state representative persuading them to pass legislation in favor of solar and wind energy!

YOUR MOVE

Take 4 carbon emissions out of the pool for the team to reuse. Move 4 spaces.

BONUS

You read a book about climate change science and recommend it to a friend!

YOUR MOVE

Take 4 carbon emissions out of the pool for the team to reuse. Move 4 spaces.

PENALTY

You could have ridden your bike, but begged for a ride from your older sister anyway.

YOUR MOVE

Move back 1 space and put 1 carbon emission into the pool.

TRANSPORTATION CHOICE

You just ran out of milk and are going to need some in the morning for cereal.

Ask your dad to drive you to the store to buy milk.

OR

Ask your dad to walk with you to the store to buy milk.

YOUR MOVE

Walk: Move 1 space, spend 1 carbon emission.

Ride: Move 4 spaces, spend 4 carbon emissions.

TRANSPORTATION CHOICE

You need to go to 3 stores to buy a birthday gift, a new shirt, and a cake.

Make 3 separate trips: Go to the toy store Wednesday, the clothes store Thursday, and the cake store Friday.

OR

Plan ahead and go to all 3 stores on Friday.

YOUR MOVE

3 separate trips: Move 3 spaces, spend 3 carbon emissions.

1 combined trip: Move 1 space, spend 1 carbon emission.

TRANSPORTATION CHOICE

Your dog needs some exercise!

Drive to the dog park.

OR

Take your dog on a walk around your neighborhood.

YOUR MOVE

Drive: Move 3 spaces, spend 3 carbon emissions.

Walk: Move 1 space, spend 1 carbon emission.

TRANSPORTATION CHOICE

You are having a birthday party at the Magical Splash Park Wonderland that's an hour from your house!

Give your guests directions and ask them to drive separately.

OR

Meet at the bus station and take the bus together.

YOUR MOVE

Drive: Move 4 spaces, spend 4 carbon emissions.

Bus: Move 1 space, spend 1 carbon emission

FOOD CHOICE

You just made a delicious turkey sandwich to take to school for lunch.

Put your sandwich in a plastic bag.

OR

Put your sandwich in reusable Tupperware.

YOUR MOVE

Plastic bag: Move 2 spaces, spend 2 carbon emissions.

Tupperware: Move 1 space, spend 1 emission.

FOOD CHOICE

You are going on a hike to Duck Creek Wetlands with your class, and you need to bring some snacks.

Bring locally grown apples and grapes.

OR

Bring packaged fruit roll ups.

YOUR MOVE

Local fruit: Move 1 space, spend 1 carbon emission.

Fruit roll ups: Move 2 spaces, spend 2 carbon emissions.

FOOD CHOICE

You are going grocery shopping with your dad.

Bring 5 cloth grocery bags from home.

OR

Use plastic bags at the store.

YOUR MOVE

Cloth bags: Move 1 space, spend 1 carbon emission.

Plastic bag: Move 3 spaces, spend 3 carbon emission

Net-mosphere!

