

Subject: Science

Grade Level: 9 - 12

Lesson Title: Carbon Footprints, Climate, and Civic Causes

Lesson Overview: This lesson provides students a connection between environmental science and civics as a means to impact the environment and the quality of life. In this lesson, students will use sources from the Library of Congress and science concepts to consider the role as civic environmentalists. Using Library of Congress primary resources and the material provided by the EPA, students will identify how humans have influenced climate change since the Industrial Revolution and a variety of methods that will give students the power to affect the climate of tomorrow. Students will be able to calculate their own carbon footprint and use the EPA material to create an action plan to impact change. This lesson can be completed in 60 – 80 minutes.

CONCEPT: Civic Service		THEME: Impact	
Overarching Essential Question: <ul style="list-style-type: none"> What are our responsibilities as citizens? 		Lesson Essential Question(s): <ul style="list-style-type: none"> How does environment impact your future life? How do you impact the environment? What environmental problems will you commit to solving and how? 	
Lesson Objectives: Students will: <ul style="list-style-type: none"> Define the importance of the environment. Analyze historical examples of negative environmental impact. Identify the causes of problems in the environment today. Calculate their individual impact on our climate today. Develop an action plan to address a current issue through civic action. 			
CIVIC KNOWLEDGE <ul style="list-style-type: none"> Roles we play in affecting our Earth and its climate Impact the actions in our history have had on our climate Roles as citizens to prevent further damage to our earth through personal, civil and communal actions 	CIVIC SKILLS <ul style="list-style-type: none"> Identifying and describing problems and solutions Explaining and analyzing information Understanding the impact of our history and its impact on the future Working with others 	CIVIC DISPOSITIONS <ul style="list-style-type: none"> Developing as an independent member of society Respecting the environment we occupy Assuming sustainable responsibilities of a citizen Promoting the health of our climate Participating in civic affairs in a thoughtful and constructive manner 	
LIBRARY OF CONGRESS RESOURCES & ADDITIONAL RESOURCES			
Library of Congress Resources Image: Down to Earth: Herblock and Photographers Observe the Environment https://www.loc.gov/exhibits/herblock-down-to-earth/exhibition-items.html Primary Source Analysis Tool http://www.loc.gov/teachers/primary-source-analysis-tool/			

Materials Needed

Library of Congress Resource (listed above)

K-W-L chart <https://www.eduplace.com/graphicorganizer/pdf/kwl.pdf>

The Nature Conservancy Carbon Footprint Calculator <https://www.nature.org/greenliving/carboncalculator/index.htm>

“Reduce, Reuse, Recycle” Resource <https://www.epa.gov/recycle>

Computer/Projector with Excel or Flash Player capability

Quick Write directions <https://ablconnect.harvard.edu/quick-write>

Handout A – Exit Slip

Supporting Question 1 ENGAGE

How does environment impact your future life?

PERFORMANCE TASK 1

K-W-L inquiry exercise to introduce lesson. Use **Primary Source Analysis Tool** to analyze the exhibit “Down to Earth.”

Supporting Question 2 EXPLORE

How do you impact the environment?

PERFORMANCE TASK 2

Pair Share to hypothesize feasible methods to create a positive impact on the future of our climate.

Supporting Question 3 EVALUATE

What environmental problems will you commit to solving and how?

PERFORMANCE TASK 3

Create an action plan to demonstrate sustainability practices.

TEACHING PLAN

PART 1 – INQUIRY INTRODUCTION

1. Begin by asking students to create a **K-W-L** chart (what they **Know**, **Want to know**, and have **Learned**) and ask them to do a **quick write** about what they know and what they **want** to know about humans’ impact on today’s climate using the question, “How does environment impact your future life?” (5 minutes)
2. Have the students volunteer to share aloud what they know already. (5 minutes)

PART 2 – INQUIRY EXPLORATION WITH PRIMARY SOURCES

3. Provide the students with the Library of Congress Resource Image: [Down to Earth: Herblock and Photographers Observe the Environment.](#)



4. Divide the students into groups of 3 or 4 and have them look over the first 5 photos in the series of pictures and select one. They can analyze the primary source material by using the **primary source analysis tool** and discussing/listing the new information they have learned. (10 minutes)
5. Ask each group to share 1-3 facts about the impact we have had on the climate that surprised them or something they did not previously know. (10 minutes)
6. Have the students name more possible ways human action or events in our history have affected the climate and write the hypotheses on the board. (5 - 7 minutes)
7. After assuring that students know the meaning of carbon footprints, ask the students “How does our carbon footprint affect the environment?” (3 - 5 minutes)
8. Provide students with [the Nature Conservancy carbon footprint calculator](#) and ask for a student to volunteer their information to demonstrate the calculator.
9. Ask students to enter their current information to calculate their carbon footprint on the smart board or projector. (5 minutes)
10. Make note of the carbon totals at the bottom of the calculator. Ask the students to brainstorm and list feasible ways they could decrease their carbon footprint. The students should brainstorm as many solutions as possible. (5 minutes)
11. Ask the students to **Pair Share** some of the ways that they could have a positive impact on the

PART 3 – APPLYING INQUIRY AND ACTION

future of the climates health. (**3 minutes**)

12. Guide students to identify a problem that they see in the environment today. (**2 – 3 minutes**)

PART 4 – INQUIRY TO DRAW CONCLUSIONS

13. Provide them with resources from the EPA Student’s [Reduce, Reuse, Recycle](#) on how students can take personal, civic or community action towards sustainability initiatives.
14. Guide students to **create** an action plan and commit to impacting the environment. (**10 minutes**)
15. Have students create an **Exit Slip** (Handout A) that reaches out to a community group, family member, or friend in order to share their environmental cause and invite that person or group to join their action. (**2 minutes**)

Citizen U Teacher Guide

Lesson Title: *Carbon Footprints, Climate, and Civic Causes*

Subject: *Science*
Grade Level: *9-12*

Overview

If you're working with students on climate change and the relationship between humans and the environment, this lesson will provide the students a chance to analyze history and also use a computational simulation to quantify their real carbon emission footprints. Students will use this lesson as a connection between environmentalism and civic action.

Learning Objectives

- Define the importance of the environment.
- Analyze historical examples of negative environmental impact.
- Identify the causes of problems in the environment today.
- Calculate their individual impact on our climate today.
- Develop an action plan to address a current issue through civic action.

Standards

HS-ESS3-3. Create a computational simulation to illustrate the relationships among the management of natural resources, the sustainability of human populations, and biodiversity.

Teacher Instructions:

- Make copies (one for each student) of the K-W-L Chart <https://www.eduplace.com/graphicorganizer/pdf/kwl.pdf>.
- Make copies (one for each student) of the LOC resource Down to Earth: Herblock and Photographers Observe the Environment <https://www.loc.gov/exhibits/herblock-down-to-earth/exhibition-items.html>.
- If students do not have access to a computer, make copies (one for each student) of Primary Source Analysis Tool <http://www.loc.gov/teachers/primary-source-analysis-tool/> .
- Make copies (one for each student) of the resource “Reduce, Reuse, Recycle” Resource <https://www.epa.gov/recycle>.
- Make copies (one for every two students) of Handout A – Exit Slip.
 - The **Exit Slip** has two per page and will need to be cut in half.

Library of Congress Resources

- Down to Earth: Herblock and Photographers Observe the Environment <https://www.loc.gov/exhibits/herblock-down-to-earth/exhibition-items.html>
- Primary Source Analysis Tool <http://www.loc.gov/teachers/primary-source-analysis-tool/>

Materials Needed

- Library of Congress Resource (listed above)
- K-W-L chart <https://www.eduplace.com/graphicorganizer/pdf/kwl.pdf>
- The Nature Conservancy Carbon Footprint Calculator <https://www.nature.org/greenliving/carboncalculator/index.htm>
- “Reduce, Reuse, Recycle” Resource <https://www.epa.gov/recycle>
- Computer/Projector with Excel or Flash Player capability
- Quick Write directions <https://ablconnect.harvard.edu/quick-write>
- Handout A – Exit Slip

**PART 1 – INQUIRY
INTRODUCTION**

I. Introduction

Begin the lesson with an inquiry-based learning exercise.

- A. Begin by asking the students to create a [K-W-L chart](#). This chart is comprised of three sections: What they **K**now, **W**ant to know and have **L**earned.
- B. Ask them to do a [quick write](#) centered on what they know and what they **want** to know about humans' impact on today's climate. **(5 minutes)**

Ask the students a question: *How does the environment impact your future life?*

- C. Have the students volunteer to share aloud what they know already. **(5 minutes)**

During this introductory to inquiry, guide the students to think about the ability of their actions to affect the future. Explain to the students that the impact we have on the world today will affect the climate tomorrow—just as events during the Industrial Revolution has an effect on the climate today.

*The K-W-L chart is an effective way to introduce an inquiry-based learning framework. Right away, by using the chart you are changing the focus of instruction from the teacher to the students themselves. Each question is centered on a student's experience. The K-W-L chart will facilitate students in processing significant content, such as climate change and civic action, through inquiry driven questions. With each explanation, students are guided to the importance of the content and its place in civics. The chart can be expanded if you so choose to include the following sections: (F) students explain the methods in which they plan to **F**ind their supportive research. (S) Students are allowed to use personal creativity in devising a way to **S**hare their findings. (R) Finally, students can **R**eflect on what they have learned. This can be a personal reflection or a group discussion.*

- [Sample K-W-L chart](#)

Quick write is a "brief written response to a question or probe" that requires students to rapidly explain or comment on an assigned topic (Green, Smith & Brown, 2007; Nunan, 2003).

Quick write <https://ablconnect.harvard.edu/quick-write>

**PART 2 – INQUIRY EXPLORATION
WITH PRIMARY SOURCES**

I. Exploration with Primary Sources

Provide, examine and analyze the LOC primary source.

- A. Provide the students with the LOC primary resource: [Down to Earth: Herblock and Photographers Observe the Environment](#).
- B. Divide the students into groups of 3 or 4 and have them look over the first 5 photos in the series of pictures.
- C. Each group should select one picture.
- D. The students can then use the [primary source analysis tool](#) to observe, reflect and question what they see in their photo—discussing/listing the new information they have learned. **(10 minutes)**

Have students answer the questions: *“What do you observe in the photo? What can you learn from your fellow groups analysis?”*

- E. Ask each group to share 1-3 things they didn’t know already. **(10 minutes)**
- F. Have the students name more ways that humans or significant events have affected the climate, writing their responses on the board. **(5 - 7 minutes)**

This section of the lesson introduces the LOC primary source material and analysis tool. The instructor can use the series of pictures from the Library of Congress to as the center of an inquiry based research exercise. Students should use the primary source material to draw connections to their actions today. The students should hypothesis feasible methods to create a positive impact on the future of our environment.

Optional Source Material: [When Did Humans Begin Polluting the Earth](#)

“Primary sources are the raw materials of history — original documents and objects which were created at the time under study. They are different from secondary sources, accounts or interpretations of events created by someone without firsthand experience. Examining primary sources gives students a powerful sense of history and the complexity of the past. Helping students analyze primary sources can also guide them toward higher-order thinking and better critical thinking and analysis skills.”

(Using Primary Sources, Library of Congress, <https://www.loc.gov/teachers/usingprimarysources/>)

Primary Source Analysis Tool <http://www.loc.gov/teachers/primary-source-analysis-tool/>

PART 3 – APPLYING INQUIRY AND ACTION

II. Applying Inquiry and Action

Students will evaluate their impact on the climate by calculating their own carbon footprints. Students will hypothesize feasible methods in which they could make positive change by means of carbon emission cutting, conservation and/or advocacy.

- A. After assuring that students know the meaning of carbon footprints, begin with inquiry. **(3 - 5 minutes)**
Ask the students a question: *How does our carbon footprint affect the environment?*
- B. Pull up and explain the [Nature Conservancy carbon footprint calculator](#). Demonstrate the calculator on a SmartBoard or projector.
- C. Ask for a student volunteer to use their information to complete the calculator. **(5 minutes)**
- D. Have students brainstorm and list feasible ways they could decrease their carbon footprint. **(5 minutes)**
- E. Ask the students to pair share some of the actions they could take to have a positive impact on the environment and the future of our climates health. **(3 minutes)**
- F. Have students use their analysis of the LOC materials and the carbon footprint analysis to identify an addressable problem they see in the environment today. **(2 - 3 minutes)**

The EPA carbon footprint calculator will be an effective exercise for instilling environmental awareness in the students. Often, one forgets their daily actions over time have a profound impact on the climate. Students will be able to be made aware of their potential to affect change whether it be negative or positive. Students can then use their environmental consciousness to apply their knowledge to a real issue and address it through civil action.

EPA resource: Excel spreadsheet [A spreadsheet version \(Xlsx\)](#)

**PART 4 – INQUIRY TO DRAW
CONCLUSIONS**

III. Draw Conclusions

Students will draw connections between what they've learned and the world today. They will be empowered to apply their knowledge to making a positive impact through well-informed civic action.

- A. Provide them with resources from the EPA Student's "[Reduce, Reuse, Recycle](#)" Resource on how students can take personal, civic or community action towards sustainability initiatives.
- B. Guide the students to create an action plan and commit to positively impacting the environment (**10 minutes**) *Action plans can be developed for future assignments or homework.

Ask the students a question: *What can we do to positively impact our environment?*

- C. Have students create an **exit slip** of a statement reaching out to a community group, family member or friend in order to share their environmental cause and invite that person to join the action. (**2 minutes**)

What starts as an idea in class can be expanded into civic action. Students who feel strongly about an environmental issue can continue to develop a well-informed action plan and act on that plan in their community.