

Highland Electric Fleets Curriculum

# Civic Science and Environmental Justice for Grades 6-12



## Contents

Teacher Implementation Guide .....	1
Activity Overview .....	1
CELF Civic Science Inquiry to Action Framework .....	1
Curricular Connections & Learning Standards .....	6
Preparing Your Students for Fieldwork .....	11
Student Action Framework .....	11
How to Get Involved with Highland Electric Fleets & CELF .....	11
Activity 1: Entry Events .....	13
Activity 2: Inquiry .....	16
Activity 3: Data Collection .....	20
Activity 4: Analysis .....	23
Activity 5: Innovation .....	25
Activity 6: Collaboration & Action .....	27

## Activity Overview

[Highland Electric Fleets](#) (Highland), in collaboration with the [Childrens’ Environmental Literacy Foundation](#) (CELFF), has developed the following six activities for middle and high school teachers, with a focus on building students’ understanding of the connections between community challenges such as air pollution and environmental health and solutions like electric vehicles. These activities and resources will support educators in fostering student voices for change through action projects. The activities are designed to scaffold in the order of 1-6, each building upon the content from the previous lesson. They have been designed for middle school grades (6-8), with each activity including extensions for high school grades (9-12).

## CELFF’s Inquiry to Action Framework

These activities are structured around CELFF’s Civic Science: [Inquiry to Action Framework](#). The framework provides a six-step process for exploring and addressing an environmental challenge in your school or community. Students collect, analyze, and share their data and collaborate to determine causes and design solutions. The process culminates with an annual Student Symposium event hosted by CELFF where students come together to present their findings to an audience of peers, community members, field experts, and policy makers, inspiring innovation and action.

### ACTIVITY 1

## Entry Event: Mapping (Place) for Community Change

Students will have the opportunity to connect to their place, becoming more inclined to care about its health, safety, and vitality. Students use these maps to explore the question, “How does the way your community is structured impact your quality of life,

specifically air quality?”

## Background Information

The way in which our communities are designed impacts the health and safety of every member of the community, either directly or indirectly. Designing communities around using automobiles for transportation can have serious consequences on public health. Transportation is one of the biggest worldwide sources of greenhouse gas emissions, accounting for around [27% of US greenhouse gas emissions in 2020](#). Automobile and bus exhaust is also one of the most serious sources of air pollution. This activity will emphasize using place, the school neighborhood, and the larger community as the context for project design and student learning experiences. This approach to teaching and learning stresses authenticity, curriculum-community connections, inquiry, process, and civic action. Mapping the community gives students the opportunity to connect to their place, becoming more inclined to care about its health, safety, and vitality.

## What is Environmental Justice?

Environmental Justice is defined by the US Environmental Protection Agency (EPA) as “...the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation and enforcement of environmental laws, regulations and policies.” Environmental Justice addresses the adverse health effects and environmental impacts that disproportionately impact poor communities. Due to America’s racialized housing policies, communities of color tend to live in more heavily polluted areas.

The Civil Rights Movement of the 1960s brought to light the public health dangers for communities of color. Professor Robert Bullard wrote, “whether by conscious design or institutional neglect, communities of color in urban ghettos, in rural ‘poverty pockets’, or on economically impoverished Native-American reservations face some of the worst environmental devastation in the nation.”

The first time an action was taken against unfair treatment and environmental justice concerns was the Memphis sanitation workers’ strike. It started when two Black sanitation workers were crushed to death by a malfunctioning garbage truck. Frustrated by this event, which was one of many abuses, 1300 Black men from the Memphis Department of Public works went on strike.

When dump trucks first rolled into Warren County, a primarily Black county, in mid-September, 1982, with truckloads of hazardous waste landfill, residents were irate. Furious that state officials had dismissed concerns over PCBs leaching into drinking water supplies, residents met and stopped the trucks by lying down on roads leading into the landfill. At the end of six weeks of protests, more than 500 people were arrested—the first arrests in U.S. history over the siting of a landfill.

The environmental justice movement gained traction when data began to roll in. Congressman Walter Fauntroy confirmed data that showed hazardous waste sites in three southeastern states were located near Black communities. A report written by the United Church of Christ showed that three out of five Latino and Black Americans lived near a toxic waste site.

Learn more about the history of the Environmental Justice movement at: <https://www.epa.gov/environmentaljustice/environmental-justice-timeline>

## ACTIVITY 2

### Inquiry: Exploring Air Quality

Students will explore air quality through various demonstrations to identify how particulate matter travels through the air.

#### Background Information

What is particulate matter? Also known as particle pollution, particulate matter (commonly abbreviated as PM) is a mix of solid and liquid particles in the air that can be hazardous to human health when breathed in. PM is all around us yet largely invisible

because of its microscopic size. However, when concentrations of particulate matter are dense enough, they become visible to the naked eye, such as smoke from a fire or the exhaust from a dirty diesel-powered bus. Particle pollution can be measured and exposures to particle pollution can be reduced and/or avoided.

Negative impacts of particulate matter from exhaust and PM<sub>2.5</sub> specifically have serious impacts on health, particularly children's health. Children are more vulnerable to poor air quality than adults because their respiratory systems are still developing and their breathing rates are faster. PM<sub>2.5</sub> can deposit directly into the lungs, aggravating conditions like asthma.

<https://aircastingactions.org/wp-content/uploads/2022/03/Air-Quality-101-Fact-Sheet.pdf>

### ACTIVITY 3

## Data Collection-Air Quality and Environmental Justice

Students will explore air quality in their community through the use of a personal air quality monitoring device or data already gathered online. By analyzing their research and findings, students will identify potential problem spots in their community and reflect on the question, "***Can we make better environmental policy decisions that lead to improvements in community health?***"

This activity explores air quality in your community through the use of a personal air quality monitoring device or through conducting research using online air quality monitoring maps like [Purple Air](#), [AirNow](#), or [AccuWeather](#). Students are tasked with identifying potential problem spots in their community where they suspect air quality is poor and particulate matter is high.

### Additional extensions:

1. For the Engagement Activity on Modes of Transportation, below are some additional questions and steps that you might consider

building in:

- a. Pick two or three bus routes students in your class take.
    - i. Calculate the distance each school bus takes to complete its route.
    - ii. How many times does each bus travel this route during a school day?
    - iii. Does the bus pick up elementary, middle, and high school students in 3 separate trips?
    - iv. What is the total distance the bus travels in one day?
  - b. Calculate the carbon dioxide emissions from those bus routes in a day, week, month, and school year.
  - c. What is the carbon dioxide released from charging an electric school bus to ride the same three routes? Calculation for charging EV school bus: [Beyond the Tailpipe Emissions calculator by region](#)
  - d. Since EV buses work a little differently and don't actually have any emissions while driving, we have to take into account the emissions for charging (fuel needed to make the electricity needed to charge the bus). So taking the charging emissions into consideration, EV buses emit approximately 646 grams of CO<sub>2</sub> per mile.<sup>1</sup>
  - e. How much less carbon dioxide would be emitted if those bus routes were driven by EV school buses instead of diesel?
  - f. If an EV bus can travel 120 miles before recharging, which can take up to 8 hours with Level 2 "slow" chargers and ~3 hours with Level 3 fast chargers, what bus routes can be traveled by EV buses?
2. Try reducing the number of car trips your family takes.
    - a. Combine errands rather than making multiple trips
    - b. Walk or ride a bike if you are within walking distance
  3. Find out what types of energy are used to produce electricity in your region of the United States.

1. [http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp\\_rpt\\_226FactSheet3.pdf](http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_226FactSheet3.pdf)

**ACTIVITY 4****Analysis- Air Quality and Policy**

Students will read “The Plain English Guide to the Clean Air Act” to further understand and describe the laws and regulations around air pollution sources and who is in charge of monitoring them. The activity will break down the Clean Air Act into small sections, making each student responsible for their section and then coming back together as a class to summarize the entire Clean Air Act.

**Background:**

The Clean Air Act did not always exist. Before the 1950s, industries and individuals were allowed to emit any kind of gas into the atmosphere without any kind of regulation or concern. As a consequence, after the Industrial Revolution, many thousands of Americans got sick, especially children. However, in 1955, the first federal legislation was passed involving air pollution: The Air Pollution Control Act. The basis of this act was only to provide funding for federal research around air pollution; no control measures were to be put in place. It wasn't until 1963, when the Clean Air Act was passed, that air pollution could be controlled by the federal government. And in 1970, the majority of what we know as today's Clean Air Act was passed, resulting in major shifts in the federal government's role in air pollution control. The Clean Air Act was dealt a major blow in 2022 when the Supreme Court curbed the EPA's power to regulate carbon emissions in *West Virginia v. EPA*.

**ACTIVITY 5****Innovation-Electric vs. Diesel**

Students will compare and contrast the similarities and differences of electric and diesel buses. Through the comparative analysis, students will identify the connections to the 3 E's of sustainability and make a case for why electric vehicles are the more sustainable solution for a healthier school community.

**Background:**

A child riding inside a diesel school bus may be exposed to as much as four times the level of diesel exhaust as someone riding in a car ahead of it. Children who ride diesel buses have 16% more exposure to inhaled NOx & air pollution. Children who ride electric buses have 8% less absenteeism than students riding diesel buses. More exposure to air pollution is linked to a higher rate of serious illness and death from respiratory illnesses including COVID-19 ([American Journal of Respiratory and Critical Care Medicine and Environmental Epidemiology](#)).

Community members from the Westchester County, NY-based group [Bedford 2030](#) advocated for cleaner school buses in their districts by sharing the following background information and call to action with their community:

“Almost all of New York State's school buses currently run on dirty diesel fuel, which causes pollution that negatively impacts children's health and causes climate change. Diesel exhaust and its byproducts have been linked to respiratory diseases like asthma, cardiovascular illnesses, cancer, and higher mortality rates.

Electrifying district fleets, especially transitioning school buses from fossil fuels to zero-emission electric buses, is of utmost importance.

Eliminating exposure to polluting diesel exhaust from fossil-fuel-powered buses will:

- Help reduce associated health risks to students and drivers
- Reduce air pollution

- Improve air quality for our entire community (and beyond)

### Optional CTE/Science Extension

Divide the class into 2 groups

#### Group 1

Students draw an electric bus identifying all parts and functions of the system

#### Group 2

Students draw a diesel bus identifying all parts and functions of the system

Each group should sketch out the parts of the bus and label the parts and functions. If there is time, they can identify where the parts and products come from and where they end up (considering the [overall product life cycle](#)). They can draw a systems map of the energy inputs and outputs.

### Innovation:

Students make the case for why electric buses are safer for the environment and public health referring to their research findings. What conclusions did they come to as a result of their research and findings?

### Optional Civics Extension

Students can present their findings to school leaders with visuals they create (charts, venn diagrams, models, etc). You can even divide students into groups for this activity.

### Highland Fleet Extension Note:

An important point about electric buses is that they, unlike diesel buses, can perform multiple functions and be “active members of the community.” In addition to transporting students, the buses can participate in vehicle-to-grid (V2G) programs with local utilities. Under V2G programs, utilities notify the bus owner when they expect demand for electricity to be higher than usual (e.g., on very hot days when

more people than usual are running their AC units) and the buses then push energy stored in their batteries back to the electric grid to help meet that extra demand.

V2G supports grid reliability: As defined by the [North American Electric Reliability Corporation](#) (NERC), grid reliability combines grid adequacy (sufficient generation to meet demand) and grid security (the ability to withstand disturbances). If there is too much demand for electricity, utilities may need to institute rolling brownouts or blackouts to keep the grid stable. Extra power provided by V2G assets can help avoid those kinds of grid interruptions.

V2G also supports grid resiliency (as defined by the [North American Electric Reliability Corporation](#) (NERC), grid resiliency includes the need to adapt and remain operational despite changing environmental threats from winter storms, heat domes, wildfires, hurricanes, and other climate events, to minimize the consequences to people and societies. In the aftermath of a hurricane, for instance, when the electric grid might be down, electric buses could be used as mobile batteries to deliver emergency power to charge phones or communications equipment, or power emergency medical stations.

## ACTIVITY 6

### Collaboration & Action-Community Action

Community Action models the process that students can take to create and present data to community stakeholders, actively participating in the democratic process. Students will be able to identify steps in achieving action in their school community. This can be applied to the previous lesson “Air Quality & Environmental Justice” or to another community issue of concern.

## Background: What is Community Action?

In the United States, we live in a democracy, a government ruled by the people. Each citizen has a say in how the government is run through the voting process. Ideally, democracy is a system that allows people real involvement in issues that affect their lives. This means working with other community members to figure out how to move forward on problems or quality-of-life issues that affect everyone. This means you might work with community members you disagree with, and conflicts may arise. “Democracy, as a response to the conflict created by difference (of opinion, of beliefs, and of personal or cultural history, for example), challenges us to think and communicate and take into account each other’s ideas as a matter of trying to live well together in the absence of absolute answers about how to do that.” -Ecojustice Education.

Conflict is not seen as something to be avoided, but as an inevitable starting point for communities to create better ways of living. This requires action, where politics becomes something that we do, not something to watch or possess. We work to improve life for everyone in the community and don’t let others do it for us.

## Curricular Connections

The lessons are designed to meet Next Generation Science Standards (NGSS) for middle and high school students, with interdisciplinary connections to common English Language Arts and Social Studies standards. This section provides a sample of curriculum connections to the NGSS, as well as state curriculum learning standards for Colorado, Massachusetts, New York, and Texas. See below.

## Next Generation Science Standards

The [Next Generation Science Standards](#) (NGSS) are K–12 science content standards that set the expectations for what students should know and be able to do. Within the NGSS, there are three distinct and equally important dimensions to learning science. These dimensions are combined to form each standard—or performance expectation—and each dimension works with the other two to help

students build a cohesive understanding of science over time. The three dimensions include the cross-cutting concepts, science & engineering practices, and disciplinary core ideas. The following core ideas are aligned to this curriculum.

### Science & Engineering Practices:

- Asking questions and defining problems
- Analyzing and Interpreting data
- Constructing explanations and designing solutions

### Core Idea MS-LS2: Ecosystems: Interactions, Energy, and Dynamics

Analyze and interpret data to provide evidence for the effects of resources availability on organisms and populations of organisms in an ecosystem.

### Core Idea MS-ETS1-1 Engineering Design

Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

### Core Idea MS-ESS3-3 Earth and Human Activity

Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.

### Cross-Cutting Concepts:

- Patterns
- Cause and effect
- Stability and change

## State Specific Alignments

### Colorado

### [Reading, Writing, and Communicating Standards](#)

The four standards of reading, writing, and communicating are Oral Expression and Listening, Reading for All Purposes, Writing and Composition, and Research Inquiry and Design. The standards

that are covered in these lesson include:

### 1. Oral Expression and Listening

- a. Collaborate effectively as group members or leaders who listen actively and respectfully; pose thoughtful questions, acknowledge the ideas of others; and contribute ideas to further the group's attainment of an objective.
- b. Deliver effective oral presentations for varied audiences and varied purposes.

### 2. Reading for All Purposes

- a. Read a wide range of informational texts to build knowledge and to better understand the human experience.
- b. Read functional texts (voting ballots, a map, a train schedule, a driver's test, a job application, a text message, product labels); reference materials (textbooks, technical manuals, electronic media); or print and non-print literary texts, to manage, evaluate, and use the myriad information available in students' day-to-day lives.

### 3. Writing and Composition

- a. Arrange ideas to persuade, describe, and inform, then engage in logical critique to gain new insights and a deeper understanding of concepts and content.
- b. Craft arguments using techniques specific to the genre.

### 4. Research Inquiry and Design

- a. Gather information from a variety of sources; analyze and evaluate its quality and relevance; and use it ethically to answer complex questions.
- b. Consider opposing perspectives and address counterarguments to their claims and the evidence they provide in support of their argument.

#### [Social Studies Standards](#)

The Colorado Academic Standards in social studies are organized by content area. The four standards of

social studies are history, geography, economics, and civics. The social studies standards covered in these lessons include:

### 1. History

- a. Develop an understanding of perspectives.
- b. Read varied sources and develop the skills necessary to analyze, interpret, evaluate, and communicate.
- c. Understand the nature of historical knowledge as a process of inquiry that examines and analyzes how history is viewed, constructed, and interpreted.

### 2. Geography

- a. Examine the characteristics of places and regions, and the changing nature of geographic and human interactions.
- b. Build an awareness of the interdependence of the world regions and resources, and how places are connected at the local, national, and global scales.
- c. Understand the complexity and interrelatedness of people, places, and environments.

### 3. Economics

- a. Understand the allocation of scarce resources in societies through analysis of individual choice, market interaction, and public policy.

### 4. Civics

- a. Research and formulate positions on local, state, and national issues or policies to participate in a civil society.

#### [Science Standards](#)

Colorado science standards consist of three dimensions that combine to form evidence outcomes at each grade level: Physical Science, Life Science, and Earth and Space Science. The standards of science covered in these lesson include:

1. **Physical Science:** Students know and understand common properties, forms, and changes in matter and energy.

**PS1:** Matter and Its Interactions

**PS2:** Motion and Stability: Forces and Interactions

**PS3:** Energy

- 2. Life Science:** Students know and understand the characteristics and structure of living things, the processes of life, and how living things interact with each other and their environment

**LS1:** From Molecules to Organisms: Structures and Processes

**LS2:** Ecosystems: Interactions, Energy, and Dynamics

**LS4:** Biological Evolution: Unity and Diversity

- 3. Earth and Space Science:** Students know and understand the processes and interactions of Earth's systems and the structure and dynamics of Earth and other objects in space.

**ESS3:** Earth and Human Activity

### Science and Engineering Practices

1. Asking questions (for science) and defining problems (for engineering)
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations (for science) and designing solutions (for engineering)
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

### Massachusetts

In reference to <https://www.doe.mass.edu/frameworks/current.html>

### ELA / Writing

- Write arguments (e.g., essays, letters to the editor, advocacy speeches) to support claims with clear reasons and relevant evidence.
- Write informative/explanatory texts to examine

and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.

- Write narratives to develop experiences or events using effective literary techniques, well-chosen details, and well-structured sequences
- Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

### ELA / Language

- Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
- Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.
- Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.

### Social Studies: Vertical Alignment for History and Social Science

1. Demonstrate civic knowledge, skills and dispositions.
2. Develop focused questions or problem statements and conduct inquiries.
3. Organize information and data from multiple primary and secondary sources.
4. Analyze the purpose and point of view of each source (distinguish opinion from fact).
5. Evaluate the credibility, accuracy, and relevance of each source.
6. Argue or explain conclusion using valid reasoning and evidence
7. Determine next steps and take informed action, as appropriate.

## New York

**ELA - Next Generation Learning Standards****Reading Anchor Standards**

- Read closely to determine what the text says explicitly/implicitly and make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
- Integrate and evaluate content presented in diverse media and formats.

**Writing Anchor Standards**

- Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
- Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.
- Draw evidence from literary or informational texts to support analysis, reflection, and research.
- Conduct research based on focused questions to demonstrate understanding of the subject under investigation.
- Gather relevant information from multiple sources, assess the credibility and accuracy of each source.

**Speaking and Listening Anchor Standards**

- Prepare for and participate effectively in a range of conversations and collaborations with diverse partners; express ideas clearly and persuasively, and build on those of others
- Integrate and evaluate information presented in diverse media and formats (including visual, quantitative, and oral).
- Present information, findings, and supporting evidence so that listeners can follow the line of reasoning.

**Language Anchor Standards**

- Acquire and accurately use general academic and content-specific words and phrases sufficient

for reading, writing, speaking, and listening; demonstrate independence in gathering and applying vocabulary knowledge when considering a word or phrase important to comprehension or expression.

**NY State Common Core Learning Standards for ELA & Literacy in Social Studies, Science and Technical Subjects**

- Read closely to determine what the text says explicitly and to make logical inferences from it, and cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
- Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.
- Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
- Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.
- Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.
- Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.
- Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
- Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.
- Present information, findings, and supporting evidence such that listeners can follow the line of reasoning, and the organization, development, and style are appropriate to task, purpose, and

audience

### Science Learning Standards

- Gather and make sense of information to describe that synthetic materials come from natural resources and impact society (MS-PS1-3).
- Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success (MS-ETS1-3).
- Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment (MS-ESS3-3).

### Texas

In reference to [Texas Essential Knowledge and Skills \(TEKS\)](#)

#### English Language Arts & Reading (6th to 12th grades):

- **Comprehension skills:** Listening, speaking, reading, and writing using multiple texts.
- **Response skills:** Listening, speaking, reading, and writing using multiple texts. Follow oral directions that involve a short, related sequence of actions.
- **Foundational Language Skills:** Listen actively and ask questions to understand information.
- Share information and ideas by speaking audibly and clearly using the conventions of language.
- **Research:** Self-select text and read independently for a sustained period of time.
- **Composition:** Listening, speaking, reading, and writing using multiple texts.
- **Inquiry and research:** Listening, speaking, reading, and writing using multiple texts. Students engage in both short-term and sustained recursive inquiry processes for a variety of purposes.
- **Collaboration:** Students develop collaboration skills to participate productively in diverse interactions within a variety of digital and social environments using the domains of listening, speaking, reading, and writing as appropriate.

- **Composition and Presentation:** Listening, speaking, reading and writing using multiple texts. Students use the modes of writing/discourse and the writing process recursively to compose multiple texts that are meaningful and legible and use appropriate conventions.

#### Social Studies:

##### [Middle School \(19A-D\)](#)

- Differentiate between, locate, and use valid primary and secondary sources such as oral, print, and visual material and artifacts to acquire information about various world cultures.
- Analyze information by sequencing, categorizing, identifying cause-and-effect relationships, comparing, contrasting, finding the main idea, summarizing, making generalizations and predictions, and drawing inferences and conclusions.
- Organize and interpret information from outlines, reports, databases, and visuals, including graphs, charts, timelines, and maps.
- Identify different points of view about an issue or current topic.

##### [High School \(28A-E, 29A\)](#)

- Analyze primary and secondary sources such as maps, graphs, speeches, political cartoons, and artifacts to acquire information to answer historical questions.
- Analyze information by applying absolute and relative chronology through sequencing, categorizing, identifying cause-and-effect relationships, comparing and contrasting, finding the main idea, summarizing, making generalizations, making predictions, drawing inferences, and drawing conclusions.
- Apply the process of historical inquiry to research, interpret, and use multiple types of sources of evidence.
- Evaluate the validity of a source based on corroboration with other sources and information about the author, including points of view, frames of reference, and historical context.

- Identify bias and support with historical evidence a point of view on a social studies issue or event.
- Create written, oral, and visual presentations of social studies information using effective communication skills, including proper citations and avoiding plagiarism.

#### College Readiness Standards:

- **Writing:** Compose a variety of texts that demonstrate clear focus, the logical development of ideas in well-organized paragraphs, and the use of appropriate language that advances the author’s purpose.
- **Reading:** Identify, analyze, and evaluate information within and across texts of varying lengths and genres. Acquire insights about oneself, others, or the world from reading diverse texts.
- **Speaking:** Understand the elements of both formal and informal communication in group discussions, one-on-one situations, and presentations.
- **Listening:** Apply listening skills in a variety of settings and contexts.
- **Research:** Formulate topic questions; and, locate, evaluate and select information from a variety of sources.

## Preparing your students for Fieldwork

Engaging students in real world experiences brings learning to life! Students become invested in their own curiosity and wonder as they explore the world around them. We have provided a few helpful tips to prepare your students for getting out in the field.

- Plan ahead and check the weather
- Recruit extra adult support and supervision
- Organize your students into working groups with specific tasks
- Be clear on the project goals and purpose of the fieldwork
- Allow for student inquiry and voice
- Identify what data you will be collecting (air quality, biodiversity, water samples, etc.)

- Plan how are you going to collect and record your data (observations, journaling, survey, etc.)
- Gather materials

## Student Action Framework

The mission of the [Young Voices for the Planet](#) film series is to limit the magnitude of climate change and its impacts by empowering children and youth, through uplifting and inspiring success stories, to take an essential role in informing their communities — and society at large, challenging decision-makers, and catalyzing change. These youth solutions to the climate crisis result in changing minds and changing society as they reduce the carbon footprint of their homes, schools and communities.

#### How to Develop Your Action Plan:

Below is a helpful framework to guide your students to taking action. First you have to identify the problem you want to investigate and find a solution for, such as “How to reduce bus emissions in your community?” or “How to integrate composting into your school cafeteria food plan?”.

Referring to the [YVFP Action Framework](#), apply the following steps to your problem.

#### Action

- **Access and Analysis** the situation
- **Collaborate** with friends, teachers, community members to brainstorm how to address the problem
- Create a **Timetable** to plan out achievable steps towards your goal
- **Identify** the people you want to share your data story with
- **Organize** a set of action steps and goals
- Share in the **News** with an authentic audience or community members

#### Student Action Case Study

- [Words have Power](#): 10-year-old Jaysa rallies the community with her speeches about how the power plant causes asthma and “so much suffering.” When they succeed in shutting down the plant,

Jaysa concludes that “words have power.”

- How to write a letter to your local legislation ([template](#))

## How to Get Involved

### Highland Fleets

With over 375 electric school buses under contract, Highland is a leader in electrifying student transportation. We’re on a mission to make electric fleets accessible and affordable for all. From reducing childhood asthma to improving local air quality, electric school buses make a measurable difference for students and communities.

- To learn more about [Highland Electric Fleets](#) and how your school can replace diesel school buses with electric buses, email [emily@highlandfleets.com](mailto:emily@highlandfleets.com).

### Children’s Environmental Literacy Foundation (CELF)

The Children’s Environmental Literacy Foundation was founded in 2003 with the mission to establish sustainability as an integral part to every child’s K-12 learning experience. Education for sustainability is a teaching methodology that develops critical thinking skills necessary to understand complex, interconnected issues. Students today face unprecedented challenges and an imperative to balance economic, social and environmental problems.

- To learn more about [CELF’s professional development programs](#) and how to engage students in civic science and action, including through participation in CELF’s annual Student Symposium event, email [victoria@celfeducation.org](mailto:victoria@celfeducation.org).

# Mapping (Place) for Community Change

## An Interdisciplinary Activity Focusing on Social Studies and ELA

### Estimated Time for Activity

~ 4-8 45-mins class periods or 2-4 90-minute class periods

### Grade Level Range

6-8 (can be scaled & modified)

### Big Ideas of Sustainability

- Long-term Effects
- Place
- Change Over Time
- Ability to Make a Difference
- Community

### Objective

- Increase the understanding of the relationship between people and the environment, and how this relationship has changed over time.
- Connect complex systems, see patterns, and look at the world from different perspectives to pinpoint potential problems in the community.
- Increase the understanding of how physical processes shape patterns in the physical environment.

### Essential Questions

- What is a community?
- What is your role and responsibility to the community?
- What can you do to change a systemic problem in your community?

### Suggested Materials

- Paper or computer, [Google Maps](#), [Google Earth](#)
- Markers & pens
- Accessibility to local maps as a reference

### Activity

1. **Exploring Maps & Tools:** Show students different types of [maps over time](#). Describe the features of various maps, discussing how maps provide context and relevance to complex ideas and situations. Possible questions to ask before mapping:
  - What do we need to know about mapping our place?
  - What makes a good map?

#### Optional ELAR Extension

Using the photos from [maps over time](#), have students use figurative language and imagery to describe past vs. present maps in a 2-3 minute Quick Write. Following the Quick Write, have several students share their writing to model the identification process.

#### Optional Differentiation Tools with Technology

- [Thinglink](#) (try if for a fun way to add layers to your maps)
- [National Geographic Mapmaker Interactive](#), mapping layers, ability to add links
- [EJ Screen](#) combines environmental and demographic indicators in maps and reports

2. **Creating Maps:** Have the teacher show students Google Maps of the local area and community. Students will use pen and paper to draw a [individual interpretation] map of your school and community. Consider the map's scale, keeping the ratio of the distance on your map consistent

with the distance in real life. Add the map scale to your map. Create a legend with symbols for neighborhood features. Include the following:

- a. Cross streets
- b. Stores (business district)
- c. Green spaces and bodies of water
- d. Industry
- e. Places of historical interest
- f. Access to public transportation
- g. Bike paths
- h. School bus and/or transit bus routes

### Optional Social Studies Extension

If students are drawing maps for the first time, be flexible with scaling. A rough draft with an inaccurate scale is a good way to get them thinking about their community and place. Have students critique each other's maps through a Gallery Walk as an added activity by having them look at each map and point out what they did well, what they're missing, what they can improve upon. Then have students draw another map taking their feedback into account.

3. What is the history of your place?
  - a. What is the story of the people who came before you? Teacher will lead class through looking at historical maps using the [time lapse](#) in Google Earth.
  - b. What is the history of your community, and how does this history continue to shape the way your community looks today? You can also look at [photographs](#) of cities over time. Can use this tool ([Living Atlas](#)) to look at different maps of cities over time.
  - c. You can use [Thinglink](#) to add video, photos, and other historical references to your map.
  - d. High school students can incorporate the EJ screen or [EJ toolkit](#) to layer different datasets and explore connecting between

demographic data and exposure/proximity to various environmental hazards.

### Optional US History & Government & Economics Extension

Introduce the word "redlining" by using the [Zinn Education Project](#) activity focusing on redlining. Have students consider their maps through the lens of planned communities with mixed types of housing units, or placement of highways, industrial locations, green spaces, etc.

4. What is environmental justice?

### Optional ELAR Extension

This extension serves as an introduction to "environmental justice" and can be done through the "Think, Pair, Share" format (longer extension) or a Quick Write and share out (shorter extension).

1. Without researching or speaking with others, have students come up with their own personal definition of "environmental justice".
  2. In small-groups (3-4), have students come up with a group definition of "environmental justice" based off of their personal definitions.
  3. Have the entire class work together to create a whole-group definition of "environmental justice".
  4. Compare, contrast, and consider (Quick Write) the whole-group definition of "environmental justice" to the EPA definition of environmental justice.
- Discuss and identify what environmental justice is, and examples of environmental injustice.
    - [EPA definition](#) of environmental justice: *"...the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation and enforcement of environmental laws, regulations and policies."*

- There is also a timeline with examples of environmental justice in the same link that can be utilized.
  - What is an example of an environmental justice issue in your community? (Reference the map created in mapping activity)
  - What are some areas in the community where air quality is poor? How is air quality an environmental justice issue?
  - Why do some areas of a community have worse air quality than others?
  - What can an individual do to improve the health of the community?
  - What can a group do to improve the health of the community?
  - Can we make better environmental policy decisions that lead to improvement in community health?

### Optional Extension with access to computers

Have students explore the EPA's EJ mapping tool: <https://ejscreen.epa.gov/mapper/>

- Give students time to interact with the Environmental Justice map. (10-15 mins)
- Have students write down what they noticed while looking at different parts of the local area/city/world. Encourage them to mess with the different mapping layers.
- Have students share their observations.
- Looking at their community, students decide on an environmental justice issue to focus on. Using the EPA mapping tool and other resources, they can do research to find out why this issue is a problem and what they can do about it.

## Questions to Check for Understanding

1. Based on the mapping activity, how has your community changed over time?
2. What actions can you take to reduce your carbon

- footprint going back and forth to school (i.e. littering, waste, trash, plastic water bottles, water usage, personal transportation, buying habits)?
3. How can we inform people about environmental injustice in our community?



# Exploring Air Quality

## An Interdisciplinary Activity Focusing on Science, Social Studies, & ELAR

### Estimated Time for Activity

~3-5 45 mins class periods or 2-3 90 mins class periods

### Grade Level Range

6-8 (can be scaled & modified)

### Big Ideas of Sustainability

- Long-term Effects
- Place
- Systems

### Objective

- Increase the understanding of the relationship between people and the environment, and how this relationship has changed over time.
- Connect complex systems, see patterns, and look at the world from different perspectives to pinpoint potential problems in the community.
- Increase the understanding of how physical processes shape patterns in the physical environment.

### Essential Questions

- What is air pollution?
- What size particles can be considered pollution?

### Suggested Materials - Part 1

- Paper/pens
- Cotton balls
- Vanilla, peppermint or other strong-smelling extract
- Closed containers
- Microscope (optional if accessible)
- Magnifying glass (optional if accessible)

### Suggested Materials - Part 2

- Petri dishes (or plastic cap), index cards & Vaseline
  - OR clear tape & white paper

### Activity - Air Quality: Seen and Unseen

#### Preparation

To prepare for this activity, have students watch one of the following videos and discuss as a class.

- [PM2.5 & Your Health](#)
- [5 Things you should know about PM2.5](#)
- Consider showing students these pictures of [Beijing](#) on a clear day compared to a smoggy day.

#### Optional Introductory Extensions

Have students write down their thoughts first and then share out and start the discussion.

##### Discussion Questions:

- What can air pollution do to your health?
- What do you think air pollution does to the environment?
- Do you know anybody who is impacted by air pollution?

##### Sentence Stems for Students:

- Something that surprised me was...
- Something new I learned was...
- An example of air pollution is...

### Part 1: Can you see air pollution? Exploring Sense of Smell

- Set up before class:
  - Soak cotton balls in vanilla, peppermint, or something that has a strong smell.
  - Place the containers in areas around the classroom and open them before class begins.
  - Have a map of the classroom visible on a white board or poster to model for students and use

later on.

- Have class-set copies of the reading [How to Understand Particle Size and Distribution for Cleaner Air](#)
- Mapping smell: Have the students create a “map of the smell” using the following procedure:
  - Have students draw a quick map of their classroom (Quick Draw 1-2 mins)
  - Students walk around the room and map out the smells with “Xs”
  - When all students are done, collectively have students identify the location of smells while the teacher writes students’ guesses on the whiteboard.
  - The big reveal - show students where each of the soaked cotton balls are

### Optional ELAR Debrief Extension

Have students do a Quick Write (2-3 minutes) answering the following questions:

- Ask the students “How does this activity relate to air quality?”
  - How do you experience air pollution through
- 
- **Jigsaw Class Reading to Introduce Particulate Matter:** Break students up into small groups and assign each group a section from [How to Understand Particle Size and Distribution for Cleaner Air](#). Give students grade-appropriate amount of time to cover the reading. Then have student-groups briefly present (30 seconds to 1 min) on their assigned section to the rest of the class

Have each group summarize their reading in one sentence and group sentences together to create whole class reader’s guide.

## Part 2: Visualizing Particulate Matter

- Set Up Before Class:
  - Smear vaseline on clear tape
  - Make copies of data sheet for each student group

### Optional Science Extension

Instead of using clear tape, smear vaseline on petri dishes that have been divided into 1 cm sections. With student direction, place the petri dishes in different locations around the school that will encounter high air pollution (ie. cafeteria, bus fleets, pencil sharpener, bathrooms, entrances / exits).

- Collect the samples after one week, divide the class into groups and pair each group with samples and make observations.
  - Each student in the group takes a 1cm section of the petri dish to observe under the microscope or magnifying glass.
  - Students make the following observations in their section using the data collection chart provided on the next page

### Visualizing the Data

Students can display their data from the chart using a bar chart or dot plot to better visualize the data. This can also be used when discussing the reflection questions. Students can display their data on poster paper (or large pieces of paper) and do a gallery walk analyzing the data.

## Particle Data Collection Sheet

Location of sample: \_\_\_\_\_

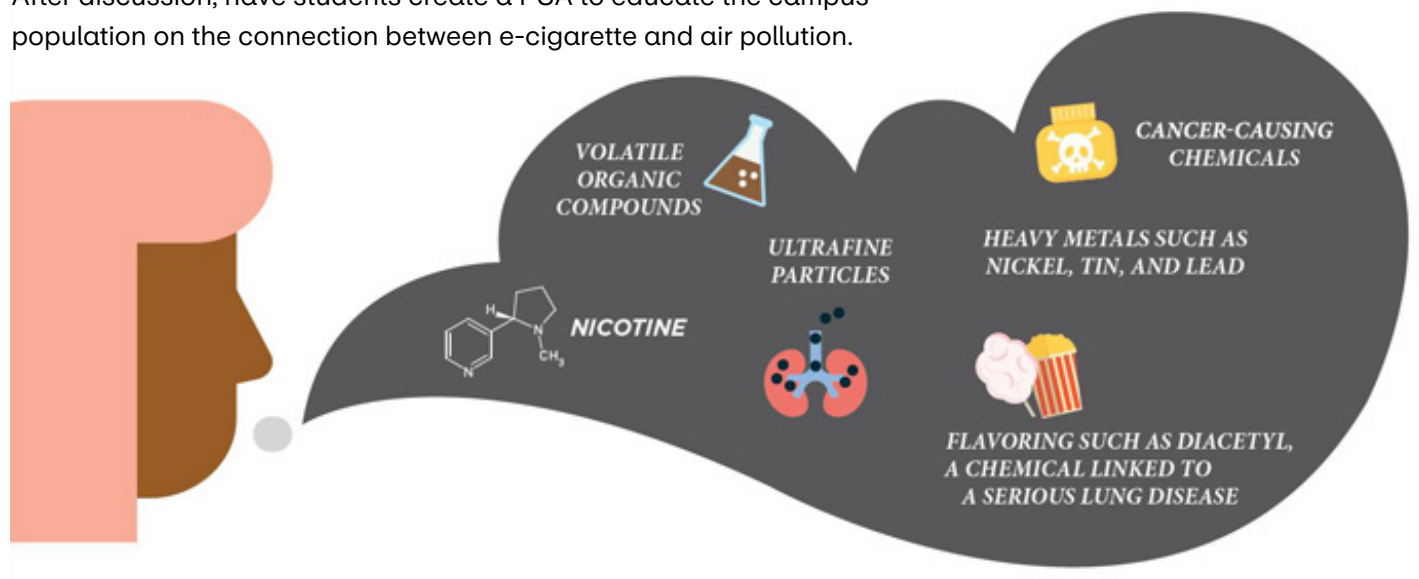
Particle Size	Number of particles identified	Possible source of particulate pollution based on location
<b>Small</b> (only visible under the microscope)		
<b>Medium</b> (visible with the magnifying glass)		
<b>Large</b> (visible to the naked eye)		

### Optional Extension for Science & Health / PE for High School

Have students read from the CDC about tobacco & e-cigarettes (focus on the What Is in E-cigarette Aerosol? section) and look at the graphic. Have students do a Quick Write and discussion answering questions:

- How are cigarettes and e-cigarettes a form of air pollution?
- What particulate matter does e-cigarette air pollution contain?
- How does e-cigarette air pollution impact your health?

After discussion, have students create a PSA to educate the campus population on the connection between e-cigarette and air pollution.



## Questions to Check for Understanding:

1. Where does particulate pollution come from?
2. What kinds of air pollution do you experience in your everyday life?
3. Describe how your senses can protect you from some forms of air pollution. Why can't your senses protect you from all types of air pollution?
4. What are the benefits and drawbacks of using the samples to calculate particle pollution?
5. Do you think what is on the samples is an accurate representation of particulate matter in the air? Why or why not?

### Optional Science Extension

Students incorporate in journals their research regarding the respiratory system protects them from particulate pollution. Make a 3D model of the respiratory system to show how PM<sub>2.5</sub> can penetrate deep into the lungs compared to other particles.

- a. Does this system always work or are there particles that pass through the cilia in the system to reach the lungs or the circulatory system?
- b. What are the long term health consequences of particulate pollution?
- c. What size particle is the COVID 19 virus? How does the size of this particle compare to PM<sub>2.5</sub>? Should you wear a mask when PM<sub>2.5</sub> levels are high?



Higher resolution image: <https://www.weforum.org/agenda/2020/10/covid-19-coronavirus-disease-size-comparison-zika-health-air-pollution/>

Resource for High School Students: <https://www.epa.gov/schools/idle-free-schools-toolkit-healthy-school-environment>

# Air Quality and Environmental Justice

## An Interdisciplinary Activity Focusing on Science and Civics

### Estimated Time for Activity

~3-5 45 mins class periods OR 2-3 90 mins class periods

### Grade Level Range

6-9 (can be scaled & modified)

### Big Ideas of Sustainability

- Fairness & Equity
- Systems
- Long Term Effects

### Objectives

- Students calculate their carbon footprint during school commute.
- Students investigate community air quality through data collection or research.
- Students map the school community to identify trends and patterns in air quality.

### Essential Question

- How can we make better environmental policy decisions that lead to improvement in community health?

### Suggested Materials

- Maps of the local area (OR a computer)
- Access to the internet

### Activity - Modes of Transportation

Using the map students created from Activity #1 or a map of the local area, then trace the route you take to school. Have students calculate how many miles they commute to school, and indicate their mode(s) of transportation.

- Calculate the amount of carbon dioxide released as a result of your mode of transportation. [Car vs Bike Calculator](#) is a great tool.
  - Cars using gasoline emit approx. 404 grams of CO<sub>2</sub> per mile<sup>1</sup>
  - Cars using diesel emit approx. 463 grams of CO<sub>2</sub> per mile
  - On average, school buses emit approximately 1,700 grams of CO<sub>2</sub> per mile
- Add up the total carbon dioxide emissions for the whole class to get to school. How much is released in one day going back and forth from school?
- Calculate the total amount of carbon dioxide released in a week, month, and school year.

### Optional Math/Science Extensions

Using the calculations from the whole class, you can divide students into groups and have them make a graph displaying their calculations. You can have each group focus on how much carbon dioxide is released in a week/month/year or have each group focus on how much carbon dioxide is released by various means of transportation, ie. cars, school bus, bike, etc. Then you can have students present their graphs to the class or display their graphs around the classroom and do a gallery walk.

<sup>1</sup> <https://www.epa.gov/greenvehicles/greenhouse-gas-emissions-typical-passenger-vehicle>

## Possible Questions to Ask Before Moving on to the Next Activity:

- Did anything surprise you about the amount of carbon dioxide used everyday?
- What effects do you think carbon dioxide or other air pollution have on our bodies? (Think back to earlier activities)
- Can we do anything to cut back our carbon emissions?

Data collection:

To prepare for this activity, watch the following videos:

- [Young Voices for the Planet: Words Have Power featuring Jaysa Hunter Mellers](#)
- [Why the “wrong side of the tracks” is usually the east side of cities by Stephen DeBerry](#)

## Option 1: Collecting Data Using an Air Quality Monitoring Device

1. Introduce the air quality monitoring device to your students. The AirBeam 3 or the Flow device from Plume Labs are good choices for personal air quality monitoring.
- Learn more about how to become a [CELFAir Champion](#) and gain access to your own Flow device. More details in the teacher’s guide.
2. Download the associated app onto a phone or tablet. A set of class tablets is helpful because you can pair each air quality device with a tablet (you cannot pair the device with more than one phone or tablet at the same time).
3. Once the device is paired with a tablet, have students open the app, and record the current air quality in the room. Make sure to include the units of measure.

**Mapping Data:**

4. Using the map created during a previous lesson or a map of the school grounds, have students identify where they think PM2.5 levels may be high. (Make sure to label map and include a legend/key).

5. Test these areas and record the PM2.5 levels.
6. Then have students test the bus drop off and pick-up areas while buses are picking up students or dropping them off. How does the PM2.5 in this area compare to other parts of the school? How do you think the data would change with electric buses?
7. Students present maps and findings to the class.

## Optional Science Extension

Have students write down their predictions (hypothesis) of where PM2.5 levels would be high. Have them explain why they chose their predictions. You can also do this as a class and come up with a class hypothesis.

After students map their data, have them look over their initial predictions and compare. Were they correct? Were they off? Then, have them revise their initial predictions, this time adding why they think PM2.5 levels were high in specific areas of the school.

If you have time, have students create a large version of their maps where they can display the whole class data they collected. Have students’ initial predictions of where PM2.5 levels would be high marked with one color and their revised predictions in another color (consider using dot stickers).

## Option 2: Researching Air Quality Data Online:

1. Introduce the online air quality monitoring maps like [Purple Air](#), [AirNow](#), or [AccuWeather](#).
2. Using the online map, look at where there are high levels of PM2.5 in your community. Where are the highest levels? Where are there lower levels? Have students record their findings in their notebooks or a sheet of paper.
3. Consider visiting the mapping site over the course of several days to see if you notice any patterns or trends in the data.

4. Compare the levels of PM2.5 in your community to those in other communities, or other areas of your community. Do you notice any patterns? Why do you think these patterns exist?

### Optional ELAR Extension

Have students do a Quick Write capturing their thoughts and what they found out about air quality and air pollution while gathering data. Use questions from step #4 as prompts.

## Questions to Check for Understanding:

1. What surprised you about the data?
2. Why do you think there are higher levels of air pollution in certain areas?
3. Is there a “safe” level of pollution? Why or why not?
4. What can I do to improve air quality in my community?
5. After reviewing the [Highland Fleets](#) website, create a list of the pros and cons of switching to electric buses. (Possible homework assignment.)

### Optional Civics and Science Extension

Have students create PSAs about the effects of air pollution on the respiratory system. They can create posters, brochures, videos, school announcements, etc. Consider displaying these around the school. Students can use this website to gather information: [Fixing School Buses is an effective way to improve student health and academic performance](#)

### Optional Civics Extension

Have students create a proposal explaining their air quality data findings and why the school could benefit from switching to electric buses. They can create a presentation digitally or with posters, then present their findings to the school or community leaders.

## 4. Analysis

# Air Quality and Policy

## An Interdisciplinary Activity Focusing on ELAR, Arts, Government and History

### Estimated Time for Activity

~3 to 5 45-minute or 3 to 4 90-minute class periods

### Grade Level Range

6-9 (can be scaled and modified)

### Big Ideas of Sustainability

- Limits
- Long-Term Effects
- Interdependence

### Objectives

- Students are introduced to the Clean Air Act.
- Students will begin to understand the value of the Clean Air Act.
- Students will identify the limits it sets for companies and individuals in what they can emit into the atmosphere.

### Essential Questions

- What kind of legislation does the United States have regarding air quality?
- Who's responsible for cleaning our air and keeping the air clean?
- What is the EPA and what does it do?

### Suggested Materials - Part 1

- Computer and internet access
- Printed copies of [The Plain English Guide to the Clean Air Act](#) (or access on the computer)
- Poster paper for students to write summary on
- Markers/colored pencils

### Activity

#### Read and Prepare

Divide class into six groups and assign each group a section from “The Plain English Guide to the Clean Air Act”

**Jigsaw Approach:** Using The Plain English Guide to Clean Air Act, have each group read a section of the guide and then they present the main ideas from each section.

#### Optional Science/Govt Extensions

High School students we will investigate [the recent Supreme Court decision that undercuts the Clean Air Act](#) and think about why companies would argue against it/how this ruling negatively affects emissions & community health.

#### Summarize

For each section, have the students write the title of their section in large font on their blank printer paper/small poster and then summarize each of their section(s) using 1-2 sentences and a picture/drawing. Students will post their sentence(s) and picture/drawing to contribute to the whole class summary of the Clean Air Act.

**\*Suggested alternative:** Have a class slideshow where each student has a slide for their section and they are responsible for writing the title, sentence summary, and picture on the slide.

#### Share out:

Once each student is finished summarizing their section of the Clean Air Act, have each student come

up to the front of the class in order of each section and present their sentence summary and picture (1 min each).

- Post each summary one after the other on the board so the students can see the whole Clean Air Act summary.

### Optional Science with ELAR Extension

High School students we will investigate [the recent Supreme Court decision that undercuts the Clean Air Act](#) and have students engage in a [Socratic Seminar](#) about why companies would argue against it/how this ruling negatively affects emissions & community health.

### Optional Literacy Extension

Have kids write their summaries & pictures or illustrations of each section on sheets of paper that can be combined into a whole class “story book” about the Clean Air Act.

### Additional ELA extension

Divide students into groups and have each group assigned another class period’s book. Each group will construct a “review” or a short blurb regarding the book.

## Questions to Check for Understanding:

1. Do you think anything is missing from the Clean Air Act? Is there anything you think should be taken away?
2. What do you think are some of the greatest sources of air pollution in your community?
3. What kinds of things can you do on an individual level to reduce your air pollution?
4. What more can profitable organizations do to invest in addressing air pollution?



# Electric vs. Diesel

## An Interdisciplinary Activity Focusing on Science and Math

### Estimated Time for Activity

~4-6 45 mins class periods or 2-3 90 minute class periods

### Grade Level Range

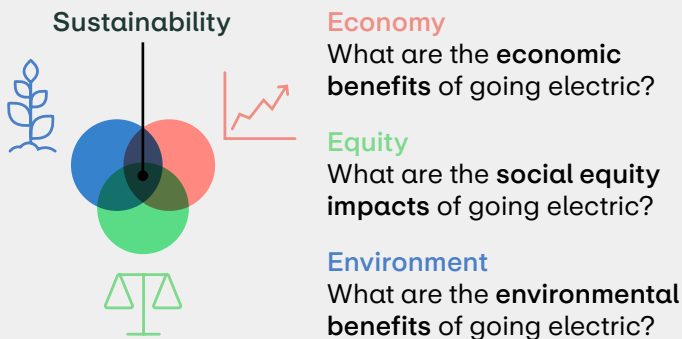
6-9 (can be scaled & modified)

### Big Ideas of Sustainability

- Community
- Ability to Make a Difference
- Change Over Time

### Objective

- To compare and contrast electric buses vs. diesel buses considering the following [3 E's of Sustainability](#):



### Optional ELAR Extension

Have students read about the [3 E's of Sustainability](#), then do a Quick Write (5 mins) about what they read. You can also jigsaw the reading and split students into groups.

After learning more about the 3 E's of Sustainability, as a class, come up with a definition for Environment, Economy, and Equity and write it down on the board or somewhere easily visible. Students can also come up with a visual for each category for further differentiation.

### Essential Questions

- How do electric buses differ from diesel school buses?
- Is it possible to have pollution-free transportation?
- How will electric buses improve the health of our school community?

### Materials

- Access to internet for research
- Paper & markers for drawings

*\*Additional background information can be found in the teacher's guide*

## Activity

### Possible Websites to Use for Research

- [Highland Electric Fleets buses info sheet](#)
- [Bedford 2030 Climate Action Now](#)
- [Highland Electric Fleets: How Electric Fleets Work](#)
- [Air Pollution from Diesel Engines](#)
- [EPA: Reduce Idling](#)
- [Children’s Exposure to Exhaust on School Buses](#) (pages 5-12)
- [NYC Environmental Health and Data Portal](#) (Air Quality hub)
- [AirCasting Actions-](#) HabitatMap

### Research

1. Have the students spend some time doing research on electric buses vs. diesel buses. Create a chart (sampled below) to compare and contrast the structural components of each.
2. Students share their findings to the class.
3. Divide students into 3 groups to further their research focused on the following:
  - a. Environmental benefits
  - b. Economic benefits
  - c. Equity impacts
4. Students share new findings to the class

### Optional ELAR/Social Studies Extension

After giving the groups some more time to re-search and present their findings, as a class draw a venn diagram with the Environment, Economic, and Equity impacts for diesel and electric buses. It should look something like this:



### Optional ELAR/Communications Extension

After students have researched about diesel and electric buses, they can discuss their ideas and findings using a structured debate OR a [socratic seminar](#). These activities help students internalize and flesh out their ideas.

### Questions to Check for Understanding:

1. Can your school switch over to EV buses? Is it feasible, given the routes the buses need to run?
2. What actions could your school take to reduce the amount of CO<sub>2</sub> and particulate matter emitted on your school campus?
3. If you tested a school bus, what impacts do you think buses have on your school community? What do you think would happen if those diesel buses changed to electric buses?

Electric Bus	Diesel Bus	Pros & Cons	Source used (citation)

# Air Quality and Policy

## An Interdisciplinary Unit Focusing on Civics & US Government

### Estimated Time for Activity

~3-6 class periods

### Grade Level Range

6-12 (can be scaled & modified)

### Big Ideas of Sustainability

- Fairness & Equity
- Ability to Make a Difference
- Community

### Essential Questions

- How can you take action in your community?
- Can your problem be solved?
- What role can you play to activate change in your community?

### Objectives

- Identify goals you want to achieve to improve the health of your community.
- Visualize the data collected and come up with an action plan.
- Take action in the community by participating in the democratic process to protect the quality of life for every living being in the community.

### Activity

The activity models the process students can take to create and present data to community stakeholders who are actively participating in the democratic process. Students will be able to identify steps in achieving action in their school community.

In preparation for this activity, students can watch the one or both of the following videos:

- Young Voices for the Planet: [Kids vs Global Warming](#)
- Highland Electric Fleets: [Electric School Bus Case study](#)

**How can you take action in your community? Can your problem be solved? What role can you play to activate change in your community?**

Refer to [Young Voices for the Planet "ACTION Plan"](#) and follow the following steps:

1. Identify the problem-- What are you most passionate about? What environmental issue is a concern to you? (ie. how to reduce bus emissions in your community?)
2. Here are some ACTION steps to take?
  - a. **Access and Analyze** the situation.
  - b. **Collaborate** with friends, teachers, community members to brainstorm how to address the problem.
  - c. Create a **Timetable** to plan out achievable steps towards your goal.
  - d. **Identify** the people you want to share your data story with.
  - e. **Organize** a set of action steps and goals.
  - f. Share in the **News** with an authentic audience

or community members.

- Share your presentation with stakeholders. (For example: local government, PTA, school administration & community)
- Become familiar with your federal, state and local elected officials and learn how to contact them through letter writing, PSA's to bring your voice forward to improve your community. <https://www.usa.gov/elected-officials> -
- Share the results / findings of your presentations and solutions on social media, local, and national news outlets.
- Share your data with other students and schools during [CELf's Student Symposium](#)

### Optional Campus Education Extension

Research local or national organizations that support community action projects.

For example:

- Bedford 2030: <https://bedford2030.org/action/clean-ride/>
- Highland Electric Fleets: <https://highlandfleets.com/>
- E School Bus 4 Kids: <https://www.eschoolbus4kids.org/whos-talking>

Then, identify ways in which you can get involved and create a posters.

- Youth Advocacy and Environmental Justice (YVFP [Words have Power](#))

### Questions to Check for Understanding:

1. How do you feel your problem can be solved?
2. How can the community support your next steps?
3. How might you engage with others in your community to help activate positive change?
4. How can you empower more community members to take action to improve the quality of their lives?

### Resource:

The mission of the *Young Voices for the Planet (YVFP)* film series is to limit the magnitude of climate change and its impacts by empowering children and youth, through uplifting and inspiring success stories, to take an essential role in informing their communities — and society at large, challenging decision-makers, and catalyzing change. <https://www.youngvoicesfortheplanet.com/about-young-voices/>

YVFP is a partner of CELF and the democracy curriculum has supported the Civic Science Inquiry to Action program.