



**2020-2021  
Program Offerings**

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**goHunterdon's free Environmental Education Program explores the connection between transportation choice and impact on the environment.**

The program is designed to educate students in **grades 5-8\*** on sustainability issues related to transportation in their communities. Focus is on understanding understand issues related to air quality, alternative energy, and the impact of transportation choice on the environment.

All lessons meet NJ Core Curriculum standards. Lessons are organized into three topic areas:

- Air Quality
- Alternative Fuels
- Electric Vehicles

**A Note about the 2020-2021 School Year**

goHunterdon understands that the 2020-2021 school year will present unique challenges to teachers, students, and parents. Each school will be modifying their operations and school schedules as appropriate to their community.

**This year, goHunterdon will provide our Environmental Education Program remotely.** This will include:

- "Lessons in a box"- Supplies delivered to schools to allow teachers to conduct "hands on" lessons with students in person.
- Adaptations of lessons for "at home learning"
- Participation of goHunterdon staff via videoconferencing
- Replacement of the Junior Solar Sprints Program with an Electric Vehicle Challenge

We know that there is much uncertainty as to what the coming school year will look and feel like. Please know that goHunterdon remains dedicated to sharing our environmental education programming with Hunterdon County students.

We invite you to browse through our offerings on the pages that follow. For more information and to schedule programming for your students, we invite you to contact:

Jodi Bettermann, Environmental Education Coordinator  
[jbettermann@gohunterdon.org](mailto:jbettermann@gohunterdon.org)



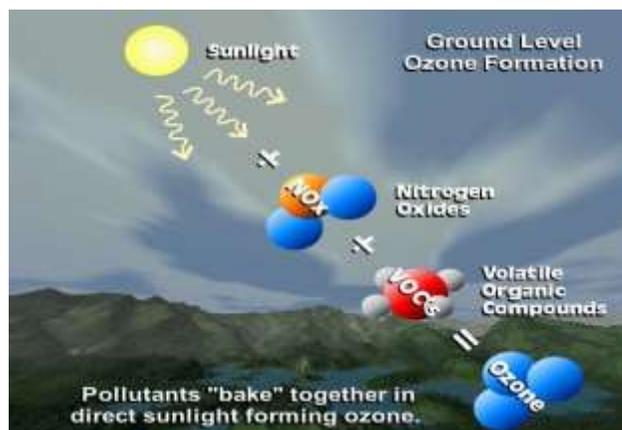
*\*For grades K-4, a lending library with books and activities is available for teachers upon request. This information is included starting on page 21.*



## Air Quality

The air we breathe is made up of a mixture of gases in the Earth's atmosphere, mainly nitrogen and oxygen. Human activity on Earth adds additional ingredients to our atmosphere which can affect our health and the climate in negative ways. These additional ingredients can be categorized as **air pollutants and greenhouse gases**.

The federal Environmental Protection Agency (EPA) has identified six common **air pollutants**: ozone, particulate matter, carbon monoxide, nitrogen dioxide, sulfur dioxide and lead.



Automobiles and other modes of transport (buses, trucks, etc.) play a large role in the emissions of many of these types of dangerous pollution, emitting four of the six common pollutants into the environment.

In New Jersey, we exceed the air quality standard level for ground ozone in all counties which affects the quality of the air we breathe.

**Greenhouse gases** in our atmosphere are defined as gases that absorb and trap heat. Greenhouse gases are needed to keep the Earth warm enough for life to survive, but concentrations of greenhouse gases that are too high contribute to global climate change. While certain levels of these greenhouse gases are necessary to make the Earth inhabitable, concentrations that are too high cause the planet to become warmer, affecting our climate.



The burning of fossil fuels such as natural gas, diesel, and gasoline contributes to higher concentrations of greenhouse gases and air pollution in our atmosphere.

In New Jersey, the transportation sector is the largest source of air pollution including particulates, nitrogen oxides, and greenhouse gases. 45% of greenhouse gas emissions and 71% of nitrogen oxide emissions can be traced to transportation here in New Jersey. New Jersey's Energy Master Plan adopted in 2019 includes a goal of 100% clean energy by 2050. This includes electrification of the transportation sector in order to reduce emissions of greenhouse gases and air pollutants that contribute to climate change.

The lessons that follow are designed to provide students with information and activities related to air quality and greenhouse gases while increasing their awareness of these as a source of global climate change.

## How Clean is the Air? Air Quality Experiment

### Learning Objectives

Students will be able to:

- Define air quality
- Describe what makes up air pollution
- Explain the scientific method

### Overview

How clean is the air you are breathing right now? How about the air at home? That is what students will find out in this lesson!

Students will create air quality monitors that they can hang at home or at school. The air testers are hung and monitored for a week. Students will look for air pollution residue on the cards. Students will chart and graph their findings.



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Remote Delivery: Lesson in a Box with all necessary supplies

Home Delivery: goHunterdon website Distance Learning activity

# Outdoor Air Quality Awareness Program

[\\*Sustainable Jersey for Schools Action](#)

## Learning Objectives

Students will be able to:

- Explain levels of Air Quality and what they mean

## Overview

Students will learn all about the Air Quality “Flag Program”, designed and implemented by the US Environmental Protection Agency, which indicates the air pollution levels around the school to let students, faculty and parents know what to expect in the way of air quality for the day.

This lesson can also be a stepping stone to implementing a flag program at your school. Staff will assist you in the implementation and set-up of the program, assist with the information outreach to students, staff, and parents.

Setting up a program to inform vulnerable populations within your school community will also make your school eligible for points in the Sustainable Jersey for Schools Program. For more information about this program please feel free to follow the link at the top of this page.

 green	Green means air quality is good.
 yellow	Yellow means air quality is acceptable.
 orange	Orange means air quality is unhealthy for sensitive groups -- people with lung disease such as asthma, children, and older adults.
 red	Red means air quality is unhealthy.
 purple	Purple means air quality is very unhealthy.

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Remote Delivery: Virtual presentation

Home Delivery: Virtual presentation

## Anti-Idling Education Program

### Learning Objectives

Students will be able to:

- Define vehicle idling
- Explain how vehicle idling can impact them and their community
- Develop strategies to improve air quality at the school

### Overview

Vehicle idling happens everywhere- at school, home, and the store. Idling cars, trucks, school buses, public and private transportation buses, and off-road construction vehicles/equipment all contribute to the degradation of local air quality. Current regulations limit engine idling for both diesel and gasoline vehicles to three minutes with limited exceptions.

The Anti-Idling Education Program begins with a game for students to learn about idling, its impacts, and alternatives.

This initial lesson may be followed up with the activities outlined on the next page.



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Remote Delivery: Lesson in a Box with supplies for activities

Home Delivery: Use supplies found at home.

## Idling Audit

Using stopwatches and tally sheets, students conduct a week long observation and data collection of the number of vehicles idling beyond NJ's 3 minute idling law outside of their school.

The data collected in the school pick-up and drop off zones establishes a baseline of information that can be used to prior to beginning a school or community wide education/awareness program.



Following education/awareness efforts, students will conduct a follow up audit to see if idling behavior has changed.

Student can present this information to the school board, PTO, or municipal body.

## Anti-Idling Design-a-Sign

Students are engaged to design a custom sign, to communicate New Jersey's "No Idle" law.

The custom sign will be produced by goHunterdon, free of charge, for installation at your school.

*\*Schools may request an official New Jersey anti-idling sign, at no cost, as well.*



## Clean Air Week Challenge

[\\*Sustainable Jersey for Schools Action](#)

### Learning Objectives

- Describe the importance of keeping the air clean at school
- Define and use alternative forms of transportation such as carpooling, walking, bicycling



### Overview

Clean Air Week challenges students, parents and faculty to reduce this impact by pledging to carpool, walk, ride the bus to school, and reduce idling every day for a week.

It can also be a way to improve air quality around the school, raise awareness of the harmful impacts of idling and “single occupancy vehicle” use (excess CO2 emissions).

A “Clean Air Week Challenge” creates a friendly competition at the school, by classrooms, or grade level, school bus, or the school as a whole to see who is a “Clean Air Champion”.

Sample activities include:

- Alternative Transportation Pledges
- Anti-Idling Education/Awareness Efforts
- Public Service Announcements
- Poster and Lawn Awareness Signs
- School Bus Driver Appreciation
- Walk/Bike to School Events (walking districts)
- Bicycle and Pedestrian Safety Presentations

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Remote Delivery: Virtual presentation

Home Delivery: Virtual presentation

# The Greenhouse Effect

## Learning Objectives

Students will be able to:

- Explain how a greenhouse works
- Explain what the greenhouse effect is and how it impacts our planet
- Name greenhouse gases and what we can do to limit their impact on our planet



## Overview

How do greenhouse gases impact our climate? Students will create their own ecosystem by putting dirt, water and decorations into 2 jars. One jar will be covered. The other jar will be left uncovered. Using thermometers attached to the inside of the jar, participants will monitor the ecosystems for 10 minutes; recording the temperature inside each jar at 1 minute intervals.

Participants will learn about how a greenhouse works to trap heat and, by extension, will learn about how greenhouse gases work within our atmosphere to make the planet warmer.

Students will then brainstorm ideas on how to decrease the greenhouse effect inside their bottles as well as how we can decrease greenhouse gases in our environment.

*\*All supplies needed to participate in the experiment are provided.*

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Remote Delivery: Lesson in a Box with all necessary supplies

Home Delivery: goHunterdon website Distance Learning activity

# Carbon Footprint

[\\*Sustainable Jersey for Schools Action](#)

## Learning Objectives

Students will be able to:

- Explain a Carbon Footprint
- Why Carbon Footprints are important
- Understand how to identify/measure their own carbon footprint
- Start the process of estimating the school's carbon footprint

## Overview

What is a Carbon Footprint? Why is it important to understand your impact on our planet? Students will learn the behaviors that contribute to own their Carbon Footprint by participating in an interactive activity. Following their calculation of their individual Carbon Footprint, students will calculate the Carbon Footprint for the class as a whole.

Optional Follow Up: The students can help conduct a school wide Carbon Footprint assessment to see where improvements could be made to make the school more sustainable. Data collected can be used to not only see the footprint the school has but also to help make small changes that can lead to big strides in helping to protect our planet. This data can also be used to see where the school can make changes to potentially save money and have an immediate impact on their students and staff.



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Remote Delivery: Online carbon footprint calculator and presentation

Home Delivery: Online carbon footprint calculator and presentation

# Alternative Energy: Renewable vs Non-Renewable Fuels

Also known as “advanced fuels”, alternative fuels are materials and substances that can be used as fuel that are other than traditional fossil fuels such as gasoline and diesel fuel.

These fuels include **electricity, biodiesel, hydrogen, compressed natural gas** and **propane**.

The following lessons will introduce students to these alternative fuels, comparing them to traditional “fossil fuels”.



On the following pages, lessons notated with this icon are complementary to the Electric Vehicle Challenge Program, which replaces the Junior Solar Sprints Program for 2020-2021.

# Drive it Green



## Learning Objectives

Students will be able to:

- Discuss fuel efficiency and what it means for the environment
- Understand how transportation choices impact the environment
- Understand the types of fuel that can power motor vehicles

## Overview

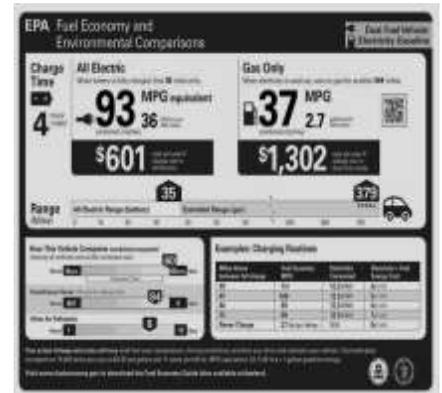
Students start out the lesson by looking at a list of seven (7) reasons that a person might consider when purchasing a vehicle (color, style, brand name, etc.)

Students are then directed to select a vehicle (sports car, sedan, pick-up truck, etc.) that they will utilize for the remainder of the class period. Students select their vehicle prior to being given any further information about the activity. Only after the student teams have selected their vehicles are they provided with a “window sticker” which will give them additional information, such as gas mileage, EPA ratings, etc.

Students are then given a “mock allowance” of \$30 to spend on fuel for their vehicle and asked to calculate how far they will be able to travel and how much pollution their vehicle will generate using the \$30 worth of fuel.

Finally, the students compete against each other on a “race board”, placing their vehicles along a chart to see how far their vehicle traveled on \$30 worth of gas and how much CO<sub>2</sub> their car emitted.

Students will discuss alternative fuels and more sustainable forms of transportation.



Remote Delivery: Lesson in a Box with supplies

Home Delivery: goHunterdon website Distance Learning activity

# Transportation and the Environment: Energy, Fuels and Emissions



## Learning Objectives:

After this lesson, students should be able to:

- Understand the sources of energy used to power vehicles.
- Understand the difference between fossil fuels and renewable/advanced fuels
- Explain why advanced fuels have lower emissions

## Overview

Building upon the “Drive it Green” lesson, students delve deeper into the different ways that vehicles can be powered and how each works:

Gasoline/Diesel

Hybrid electric

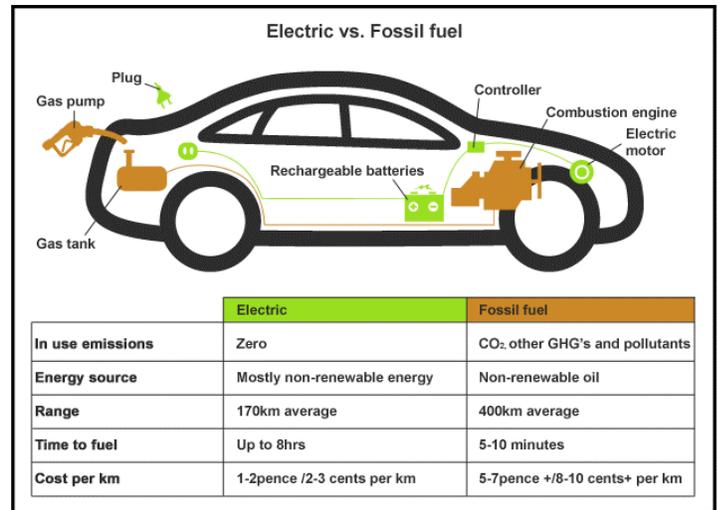
Battery electric

Biodiesel

Compressed natural gas/propane

Hydrogen fuel cell

Students will then have the opportunity to apply what they have learned by designing their own eco-friendly transportation vehicle of the future. Design criteria will include New Jersey’s goal to have 100% clean energy by 2050 as well as appeal to consumers of the future.



Remote Delivery: Lesson in a Box with all necessary supplies

Home Delivery: Virtual presentation

# Green Marketing



## Learning Objectives

After this activity, students should be able to:

- Write an advertisement for a hybrid vehicle.
- Use a full range of strategies to comprehend technical writing, newspapers, magazines, etc.
- Write in the content areas using the technical vocabulary of the subject accurately.
- Learn the principles of comparative analysis.



## Overview

Part of successful engineering invention and innovation is exploring the factors that determine success or failure in the competitive marketplace. This includes knowing your product, your competition and your potential customers. Successful engineers have strong written and oral communication skills suitable for a range of audiences. Even though engineers themselves may not create the advertising, they must clearly explain to the advertisers the product benefits.

Students will learn basic marketing concepts and use professional marketing techniques to compose an advertisement for a hybrid vehicle. In the process,

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Remote Delivery: Virtual presentation and classwork

Home Delivery: Virtual presentation and work at home

# Electric Vehicles



In April 2020, Governor Phil Murphy announced that New Jersey will work toward electrification of the transportation sector in support of the goal of 100% clean energy by 2050.

New Jersey's transportation sector is the source of 45% of greenhouse gas emissions and 71% of nitrogen oxide emissions in the state. These emissions lower the quality of the air we breathe, contributing to health effects like asthma in our communities. They also contribute to climate change by increasing the concentration of greenhouse gases in the atmosphere.



The energy source for a traditional internal combustion engine for a vehicle is gasoline or diesel fuel, both of which are fossil fuels burned to provide power to the vehicle to make it move. The energy source for an electric vehicle is electricity. The electricity comes from charging the batteries in the vehicle by plugging it into a charging station. The charging station gets its electricity from electric utility lines which can receive electricity from a power plant, solar array, wind turbine, or other source of energy. In New Jersey the emissions from electricity generation is much lower than from transportation at only 18% of the state's greenhouse gas emissions.

The electric car is actually not a new invention. The first ones were not very practical, but in the late 1800's electric wagons hit the road. In 1900 in the U.S. about half of all vehicles on the road were electric. They continued to be popular until the Model T which used an internal combustion engine and ran on gasoline became mass produced and much more affordable than the electric car.

New Jersey's energy strategy for the future relies on electrification of transportation. Improvements in battery technology have reduced the prices of electric vehicles and charging stations are becoming more prevalent.

Electric vehicle sales in New Jersey have been growing and currently there are more than 30,000 electric vehicles registered. Here in Hunterdon County we have 686 electric vehicles on the road as of December 2019. The goal is to have 330,000 light duty vehicles on the roads in New Jersey by 2025, only 5 years from now. We have a long way to go!

The lessons in this section introduce electric vehicle concepts and increase awareness of the benefits to us and to our environment.

## Introduction to Electromagnets

### Learning Objectives:

- What is an electromagnet and how is it useful?
- What is the connection between electricity and magnetism?
- How is an electromagnet different from a standard magnet?



### Overview

Electromagnetic energy affects us every day. The sun's energy is electromagnetic energy. The stars we can see at night are electromagnetic radiation that travels through space to reach us as light. Even we give off electromagnetic energy in the form of heat. It's everywhere, but what exactly is it?

Electromagnetism is the study of the relationship between electricity and magnetism. Scientists such as James Maxwell studied electromagnetism to help define it both scientifically and mathematically. Engineers have applied the principals of electromagnetism to create devices that benefit society such as computers, cell phones, hair dryers, electric generators, and electric cars, to name a few.

Students will learn about this invisible force, electricity, magnets, and magnetic fields. They will understand that wire carrying electric current can produce a magnetic field which can be used to create an electromagnet. Then they will construct their own simple electromagnets and test them out.

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Remote Delivery: Lesson in a Box with all necessary supplies

Home Delivery: Virtual presentation

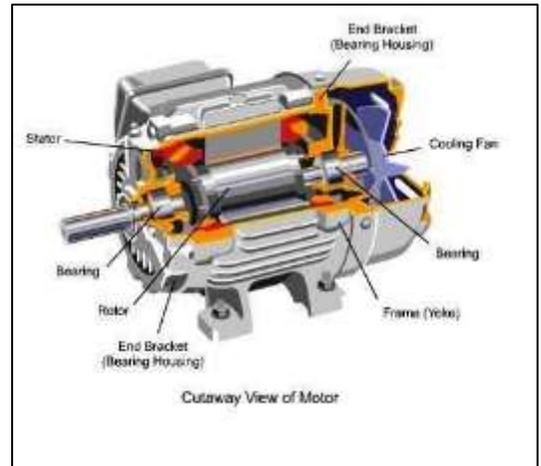
# Electricity Makes Things Go

## Learning Objectives:

- Learn how electric motors work
- Use electromagnets to make a simple motor
- Relate electric motors to hybrid electric and battery electric cars

## Overview:

Motors are used everywhere in our world. Electric motors drive our refrigerators, computers, air conditioners, and even cars if your family owns a hybrid electric or battery electric vehicle.



What are motors and how do they work? Motors use electrical energy and convert it to mechanical energy which makes things move. The key to this conversion of energy is electromagnets. Electromagnets are created by wrapping a coil of wire around a magnetic material such as iron, and running electricity through it. The electric current makes a magnet out of the iron in the middle of the coil. When the current is turned off, the iron is no longer magnetic. This is different from standard or permanent magnets which do not require electricity and are always magnetic.

Students will use permanent magnets and electromagnets created using a coil of wire and a battery in order to make a simple motor that they will use to wind up string to pick up paperclips attached to the end of the string.

Electric motors in hybrid or battery operated vehicles use the same concept except the motors are much more powerful. These vehicles have no harmful emissions when they use their electric motors because they don't need to use gasoline to fuel them. Hybrid vehicles only use gasoline powered combustion engines for part of the time they are running so their emissions are much lower than traditional cars, making them much more environmentally friendly.

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Remote Delivery: Lesson in a Box with all necessary supplies

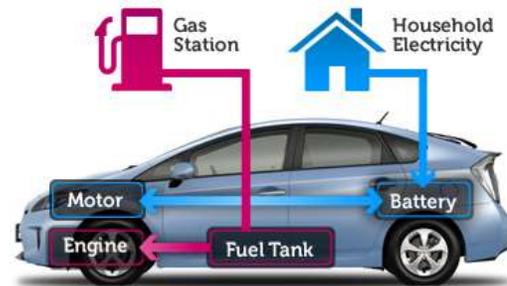
Home Delivery: Virtual presentation

## Hybrid Vehicles



### Learning Objectives:

- Differences between a hybrid vehicle and internal combustion engine vehicles.
- Explain the difference between parallel and series hybrid engines



### Overview:

There are many types of hybrid engines in use today not only for cars and trucks but also for other types of transportation like trains and submarines. Just like there are parallel and series electric circuits, there are both parallel and series hybrid engine configurations. Each set up has its advantages and uses.

After an introduction to basic circuit schematics, students will investigate these different forms of hybrid engines. They will apply their understanding of the difference between series and parallel configurations to current research on hybrid vehicles and will complete an activity to demonstrate their understanding of the concepts introduced.

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Remote Delivery: Virtual presentation

Home Delivery: Virtual presentation

# Moving with STEM – Coming Soon!

Open ended engineering challenges based on transportation choice through the lens of STEM (Science, Technology, Engineering, and Mathematics) Education are under development and will be included here. Through these program students will work to solve problems dealing with transportation and will work through the design and build process to develop solutions to the issues posed.





## Elementary Education Lending Library

**Grade(s): 1-4**

goHunterdon lends from a collection of books that introduce the topics of transportation choice, energy usage, and air quality and their effects on human health and the environment.

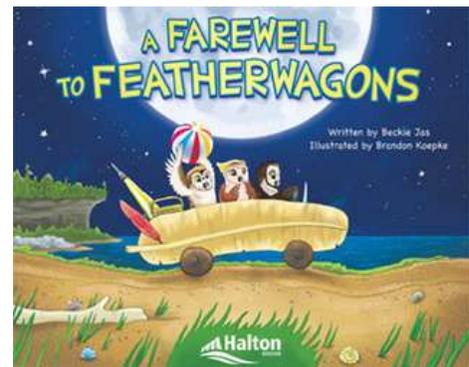
Books and lessons are available for teachers to “check out” for use in their classrooms. Each book described on the following pages may be read aloud, followed by an interactive.

Contact Jodi Bettermann at [jbettermann@gohunterdon.org](mailto:jbettermann@gohunterdon.org) to request a book and associated activity. Books and materials will be delivered to you for use with your students.

### **AVAILABLE BOOKS:**

#### **A Farewell to Featherwagons**

In the first book of the “Owls for the Environment” series, students are introduced to a group of fictional owls who take a trip to the lake. Along the way, they realize that their current mode of transportation, the “featherwagon”, is having an impact on the environment and their health. Eventually the owls realize that it would be better to use their wings rather than their vehicle to get places that they want to go.



#### **Wings and Thingamajigs**

In the second book, the owls go to school.

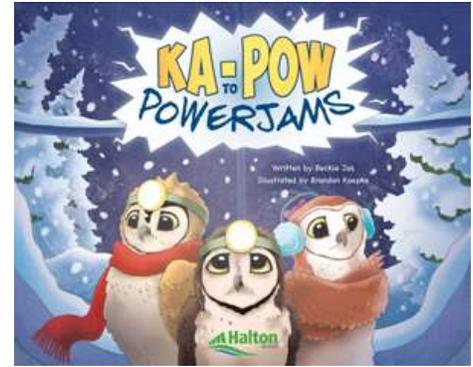
When the owls arrive on the first day, all of the featherwagons are idling in front of the school. Teacher, Mrs. Hootz, gives her students an assignment to design and build a “thingamajig” as an alternative to the polluting feather wagons. The owls come up with many fun ways to get to school without their featherwagons.



### **Ka-Pow to Powerjams**

In the final story of the series, the owls learn about energy conservation and emergency preparedness.

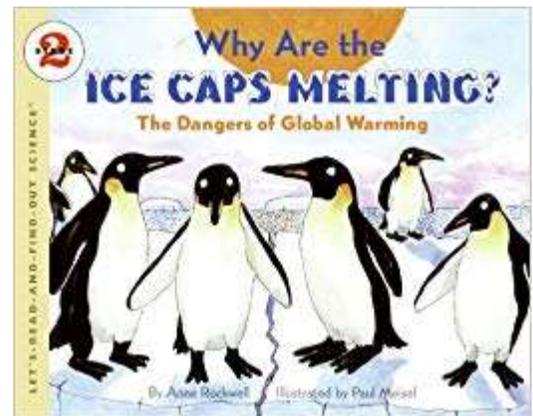
When the owls have to survive a blackout they learn about how they can have an impact on the environment by conserving energy.



### **Why Are the Ice Caps Melting?**

This book looks at changes to the planet and what this means for life on Earth. The planet is getting warmer, but what is causing it? Is it a natural fluctuation of the planet? Do humans have something to do with it?

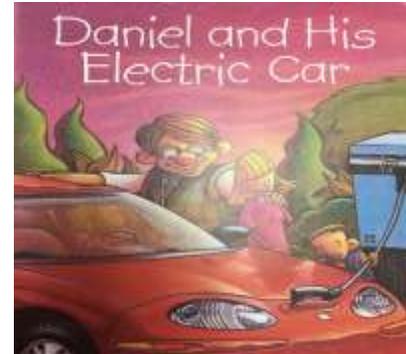
Following the reading of the book aloud, students will participate in a "Memory Game" that will require them to remember and employ information from the book.



### **Daniel and His Electric Car**

Daniel and his family are trying to decide which type of vehicle to buy.

Following the reading of the book aloud, students will discuss electric vehicles as an alternative to traditional fossil fuel powered engines. Discussion will also include information on hybrid technology.



### **Running on Sunshine**

Students will learn how solar energy and solar panels work and how solar technology is being integrated into our daily lives.

Discussion will include how solar energy can power electricity and electric vehicles.

