

Today I Learned About Electric Cars

Description:

Electric vehicles (EVs) hold great promise for a lower-emissions future – but just how much promise? Students investigate the emissions associated with EV use in different parts of the US. Then, they learn about the air pollution impacts of gas and diesel vehicles and design a communication project to reduce exposure at school.

Skills & Objectives

SWBAT

- Connect the way that electricity is produced with the carbon dioxide impact of an electric vehicle.
- Explain the connection between gas and diesel vehicles and air pollution and describe some solutions.
- Design a communication project to effect change in their school.

Skills

- Map reading
- Data analysis
- Communication

Students Should Already Know That

- Electricity is generated in a variety of ways, some of which produce high amounts of carbon dioxide, while others produce small amounts.

Standards Alignment:

HS-ESS3-4 Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs.

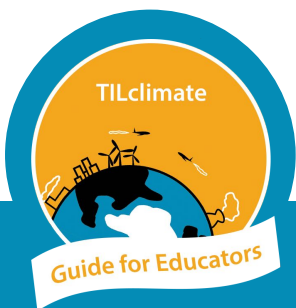
RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media in order to address a question or solve a problem.

Disciplinary Core Ideas:

ESS2.D Weather and Climate

ESS3.D Global Climate Change

ETS1.B Developing Possible Solutions



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How To Use These Activities:



Pages with the circular “TILclimate Guide for Educators” logo and dark band across the top are intended for educators. Simpler pages without the dark band across the top are meant for students.

Each of the included activities is designed to be used as a standalone, in sequence, or integrated within other curriculum needs. A detailed table of contents, on the next page, explains what students will do in each activity.

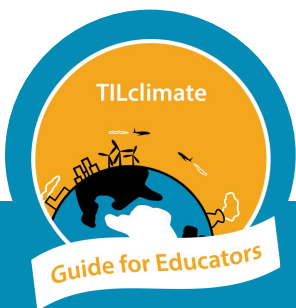
A Note About Printing

All student pages are designed to be printable in grayscale, except for the flags on page 6. A few copies of this page could be printed color for students to share, or the image projected in the classroom.

The worksheets do not leave space for students to answer questions. Students may answer these questions in whatever form is the norm for your classroom – a notebook, online form, or something else. This allows you, the teacher, to define what you consider a complete answer.

Podcasts in the Classroom: Throughout these Guides for Educators, we invite students to think about how they would share their learning with family and friends. One way to do this is to encourage your students to create their own podcasts - they're shareable, creative, and have multiple options for embedded assessment. We would love to hear any podcasts or see any other projects you or your students create! Email us at tilclimate@mit.edu, Tweet us @tilclimate, or tag us on Facebook @climateMIT.

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Detailed Table of Contents

Page	Title	Description	Time (min)
	Podcast Episode	Students listen to TILclimate: TIL about electric cars, either as pre-class work at home or in the classroom. https://climate.mit.edu/podcasts/til-about-electric-cars	10-15
1	Where Does Your Electricity Come From? (internet required)	Students investigate the resource mix that feeds electricity generation in their region and consider the balance of low- and high-CO ₂ resources used.	15-20
5	Fuel Efficiency (internet required)	Students calculate the relative efficiency of electric vehicles in different states, based on the resources used to generate electricity in that state.	15-20
7	Air Pollutants: Communication Project	Students learn about air pollution from gas-burning vehicles, and some best practices for reducing the health impacts. Then, they design a communication project to reduce exposure at their school.	30-45+
9	99 th Percentile Vehicle Use	Students collect anecdotal data and discuss whether most people could use an EV for their daily car use.	30-45+
10	How Much Does an EV Cost? (internet required)	Students use the CarbonCounter tool to investigate the relative costs and emissions of all-gas, hybrid, and all-electric vehicles.	20-30+

For more activities about the electric grid, see the Electric Grid and Climate Change Educator Guide <https://climate.mit.edu/til-about-electric-grid-educator-guide>.



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Electric Vehicles

This Educator Guide includes two data investigations, a communication project, and a discussion. Educators may pick and choose among the pieces of the Guide, as suits their class needs.

Parts of this Guide may align with the following topics:

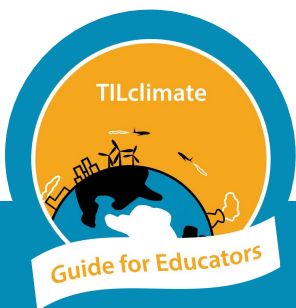
- Physical science: Atmospheric chemistry, fossil fuels, and electric motors.
- Life/environmental science: Impacts of cars on the environment and human health.
- History/social science: History of electric vehicles, human health impacts of cars.
- ELA/literature: Connections to futuristic science fiction, imagining future transportation.
- ELA/nonfiction: Communication projects, identifying audience and platform.

MIT Resources

We recommend the following as resources for your own better understanding of climate change or as depth for student investigations. Specific sections are listed below:

- Climate Science, Risk & Solutions, an interactive introduction to the basics of climate change. <https://climateprimer.mit.edu/>
 - Chapter 02
 - Chapter 08
 - Chapter 10
- MIT Climate Portal Explainers are one-page articles describing a variety of climate topics. New Explainers are posted monthly. <https://climate.mit.edu/explainers>
 - Greenhouse Gases
 - Renewable Energy
 - Cities and Climate Change

Car and Driver Magazine has an overview of the history of electric vehicles <https://www.caranddriver.com/features/g15378765/worth-the-watt-a-brief-history-of-the-electric-car-1830-to-present/>



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Wrap-Up Discussion Questions

- What percentage of your electricity comes from low- or no-CO₂ sources?
- Given this, how do you think your CO₂ emissions from electricity compare to other regions?
- Do you think there is any place in the US where an all-electric vehicle produces as much or more CO₂ than does an all-gas vehicle? How much variation is there across the US?
- How could our school help protect students, teachers, and staff from air pollution?
- Are you excited about electric vehicles? Why or why not?
- What problems could electric vehicles solve? Which problems do they not solve?
- What surprised you about electric vehicles? What questions do you still have?

Climate Solutions

Climate solutions can be thought of as falling into four categories outlined below. Across all categories, solutions at the community, state or federal level are generally more impactful than individual actions. For example, policies that increase the nuclear, solar and wind mix in the electric grid are generally more effective at reducing climate pollution than asking homeowners to install solar panels. For more on talking about climate change in the classroom, see “How to Use This Guide”.

•Energy Shift

How do decision-makers make the switch from carbon-producing energy to carbon-neutral and carbon-negative energy?

•Energy Efficiency

What products and technologies exist to increase energy efficiency, especially in heating and cooling buildings?

•Adaptation

How can cities and towns adapt to the impacts of climate change?

•Talk About It

Talking about climate change with friends and family can feel overwhelming. What is one thing you have learned that you could share to start a conversation?

What solutions are the most exciting in your classes? We would love to hear from you or your students! Images, video, or audio of student projects or questions are always welcome. Email us at tilclimate@mit.edu, Tweet us @tilclimate, or tag us on Facebook @climateMIT.

