



Electric Vehicles Toolkit

DECODING THE DRIVE: GAS, HYBRID, OR ELECTRIC

HIGH SCHOOL PHYSICS / ENVIRONMENTAL SCIENCE

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Decoding the Drive: Gas, Hybrid, or Electric

A Comparison of Vehicle Type

Lesson Overview	Career Highlight
Students will compare gas-powered, hybrid, and electric vehicles using a choice board and anticipation guide, play a round of jeopardy, and learn how new electric vehicle (EV) technologies can integrate into older gas-powered cars.	Software Developer

STEM Course Connections	21st Century Skills	CTE Alignment
High School Earth Science High School Environmental Science High School Physics High School Chemistry	Communication and Collaboration	Career Readiness

Engineering Activity	
Science and Engineering Practice #8	Students will obtain information using a choice board of websites, articles, videos, and podcasts.

Materials
<ul style="list-style-type: none"> ● Student Handout ● Device with internet access

Essential Questions
1. What are the similarities and differences between electric vehicles, hybrid, and gas vehicles?

Background Information
<p>Gas, hybrid, and electric vehicles have many similarities & differences. A gas car has a combustion engine and uses the concept of burning fuel to create energy and power the car. On the other hand, an electric car uses a battery to power a motor. The motor transfers the battery's electricity into mechanical energy to power the car. The hybrid is a mix of a gas and electric vehicle. It has both a combustion engine and an electric motor. Gas and hybrids have hundreds of moving parts to power the combustion engine. On the contrary, the electric vehicle only has one moving part, the motor. An EV produces significantly less emissions than a gas or hybrid vehicle. Although the EV does not produce emissions while driving, they are still created during the creation of their batteries and also when charging.</p>

Mission Prep

Engage (5 mins)

1. Anticipation Guide

Complete the Anticipation Guide in [the student handout](#) with their prior understanding of gas, hybrid, and electric vehicles.

Explore (25 mins)

1. Choice Board

Students can select from the menu of articles, videos, and podcasts about electric, hybrid, and gas-powered vehicles in [the student handout](#).

2. Venn Diagram

Students will fill in a Venn Diagram while visiting sources. Here is a [Canva Template](#) that they can use if they'd like to make it digitally.

3. Career Connection

Have students share some of their responses for their Venn Diagram. Highlight the similarities and differences that they have identified.

Pose the question: How will job sectors change too?

Share the SEMI career profile [video](#) of Jessica, the software engineer from NVidia. Discuss her path and how it may be a growing/changing field for the automotive industry.

Launch

Explain (15 mins)

1. EV Jeopardy


In partners, small groups, or as a whole class, play this EV [Jeopardy Game](#)

Elaborate (30 mins)

1. Converting Gas to Electric Video

As a class, show the following video.

How Do Electric Vehicles work? CNBC's How to Convert a Gas-Powered Car to an Electric Vehicle

 [How To Convert A Gas-Powered Car To An Electric Vehicle](#)

2. Small group Follow-Up Discussions

In small groups have students discuss and respond in [their student handout](#) to:

- a. Summarize the key points from the video
- b. How are they repurposing parts to convert a gas-powered car to an electric car?
- c. In the video, there is a reference to the time period when computers were first being introduced. Do you feel like this is a similar transition? Why or why not?

Exploration

Evaluate (5 mins)

1. Exit Ticket

Have students revisit their [Anticipation Guide](#) and "correct" their own responses in a different color.

CA NGSS Standards

- HS-PS3-1. Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.
- HS -PS3.D: Energy in Chemical Processes - Although energy cannot be destroyed, it can be converted to less useful forms—for example, to thermal energy in the surrounding environment.
- HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems

CTE Alignment

- EA 4.1 Use electronic reference materials to gather information and produce products and services.
- EA 4.3 Use information and communication technologies to synthesize, summarize, compare, and contrast information from multiple sources.
- EA 5.4 Interpret information and draw conclusions, based on the best analysis, to make informed decisions.

Resources

California Air Resources Board. (2021). *Battery-Electric Cars*. DriveClean.

<https://driveclean.ca.gov/battery-electric>

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<https://www.caranddriver.com/research/a32781943/electric-cars-vs-gas-cars/>

Energy Sage. (2023, May 30). *Costs and benefits of electric cars vs. conventional vehicles*. Electric Vehicles.

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Idaho National Laboratory. (2015). *How do gasoline & electric vehicles compare?*. Advanced Vehicle Testing Activity.

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<https://climate.mit.edu/ask-mit/are-electric-vehicles-definitely-better-climate-gas-powered-cars>

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Electricity. <https://afdc.energy.gov/fuels/electricity.html>

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