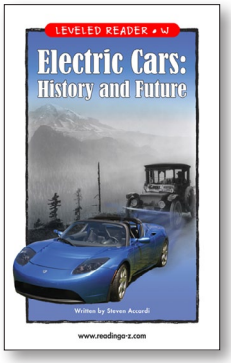
Lesson Plan

Electric Cars: History and Future



About the Book

Text Type: Nonfiction/Informational **Page Count:** 24 **Word Count:** 1,817

Book Summary

Could many traffic problems have ended long ago if the electric car had gained more popularity? In the 1830s, Robert Anderson of Scotland invented the first electric carriage. Through the years, many improvements and inventions by others led to the popularity of electric cars in the beginning of the twentieth century. Is it possible for the electric car to be a thing of the past and the car of the future? Photographs and diagrams support the text.

About the Lesson

Targeted Reading Strategy

- Summarize

Objectives

- Use the reading strategy of summarizing to understand text
- Identify details to compare and contrast in nonfiction text
- Identify parts of a complex sentence
- Identify and use hyphenated compound adjectives

Materials

Green text indicates resources available on the website

- Book—*Electric Cars: History and Future* (copy for each student)
- Chalkboard or dry erase board
- Dictionaries
- Compare and contrast, complex sentences worksheets
- Discussion cards

Indicates an opportunity for students to mark in the book. (All activities may be demonstrated by projecting the book on interactive whiteboard or completed with paper and pencil if books are reused.)

Vocabulary

*Bold vocabulary words also appear in a pre-made lesson for this title on VocabularyA–Z.com.

- **Content words:**
  - **Story critical:** ***alternative*** *(adj.),* ***efficient*** *(adj.),* ***emissions*** *(n.),* ***environment*** *(n.),* ***exhaust*** *(n.),* ***hybrid*** *(adj.)*
  - **Enrichment:** *atoms (n.),* ***breakthrough*** *(n.),* ***chemical reaction*** *(n.), dangerous (adj.),* ***eliminated*** *(v.), flamboyant (adj.), generation (n.), methods (n.),* ***mobility*** *(n.), nuisance (n.),* ***production*** *(n.), prosperous (adj.),* ***prototypes*** *(n.), pungent (adj.), quantity (n.)*

Before Reading

Build Background

- Show students photographs of different types of cars and trucks. Show some examples of gasoline-engine cars and hybrid or electric-powered cars. Ask students to describe what they see in the photographs, comparing and contrasting the physical characteristics of the different vehicles.

- Ask students if they know anyone who owns an electric or hybrid car, and what the benefits are to owning one (fewer emissions make them more environmentally friendly, better gas mileage means saving money, some cities allow single drivers in carpool lanes, free parking or special parking permits, and so on).

Preview the Book

Introduce the Book

- Give students their copy of the book. Guide them to the front and back covers and read the title. Have students discuss what they see on the covers. Encourage them to offer ideas as to what type of book it is and what it might be about.
- Show students the title page. Discuss the information on the page (title of book, author's name).
- Ask students to turn to the table of contents. Remind them that the table of contents provides an overview of what the book is about. Ask students what they expect to read about in the book based on what they see in the table of contents. (Accept all answers that students can justify.)

Introduce the Reading Strategy: Summarize

- Explain to students that one way to understand and remember information in a book is to write a summary, or a brief overview, of the most important information in a section. Point out that a summary often answers the questions *who, what, when, where,* and *why.*
- Create a chart on the board with the headings *Who, What, When, Where,* and *Why.* Read pages 4 and 5 aloud to students and model summarizing.
  Think-aloud: *To summarize, I need to decide which information is the most important to remember in a section. To do this, I can consider who and what the section was about, what happened, and when and why it happened. Then I can organize that information into a few sentences. This section is mostly about you taking the bus to school (the author is asking the reader to imagine). The author also writes that there are other kids on the bus, and that you soon get stuck in a traffic jam. I will write you and other kids under the heading* Who, *and* taking the bus to school *and* getting stuck in a traffic jam *under the heading* What. *Cars, trucks, and motorcycles are everywhere, but none of them are moving. I will write* cars, trucks, motorcycles everywhere and nobody's moving *under the heading* Why. *I also read that this smelly, noisy traffic could have ended long ago if the electric car had gained more popularity. I will also add* traffic problems could end with electric cars *under the heading* Why. *I can infer that this might happen in a modern city. I will write* cities *under the heading* Where, *and* present-day *under the heading* When. *When I organize all of this information, a summary of pages 4 and 5 might be:* You and the other kids are sitting in a traffic jam on the way to school. The bus is caught in the middle of cars, trucks, and motorcycles everywhere—and nobody's moving. Long ago, if people would have bought electric cars, these smelly, noisy traffic problems could have ended.
- Write the summary on the board. Discuss how you used the information in the chart, along with your own words, to create the summary.
- As students read, encourage them to use other reading strategies in addition to the targeted strategy presented in this section.

Introduce the Comprehension Skill: Compare and contrast

- Explain that one way to understand concepts in a book is to tell how the information is similar and different.
- Cut out photographs from the book that clearly illustrate differences between gas-burning vehicles and electric vehicles. Show students the city traffic jam with lots of cars and then the electric vehicles. Model how to compare and contrast using clues from the photographs.
  Think-aloud: *In these photographs, I see a bunch of gasoline-burning vehicles, and I see some electric vehicles. I see that some things about them are the same, and some things are different. I notice that both types of cars have four wheels, windows, and room for people to sit inside. However, it seems as if the electric vehicles are smaller than a lot of the gasoline-burning cars and trucks. I also notice that there are many more gasoline vehicles on the road than electric. It seems*

as if the air might be cleaner around the electric cars and that there is a haze of exhaust around the gasoline vehicles.

- Model how to compare and contrast information using a Venn diagram. Draw a Venn diagram on the board. Label the left circle *gasoline vehicles* and the right circle *electric vehicles.* Explain that information telling how a gasoline vehicle and an electric vehicle are similar is written where both circles overlap. Information that is only true of a gasoline vehicle is written in the left side of the left circle. Information that is only true of an electric vehicle is written in the right side of the right circle.
- Have students identify other similarities and differences between gasoline vehicles versus electric vehicles. Add this information to the Venn diagram.

Introduce the Vocabulary

- Write the following words from the content vocabulary on large pieces of paper to be hung up around the room: *efficient, hybrid, emissions,* and *exhaust.* Read each word aloud with students.
- Place students in small groups and assign each group to a word poster. Have them discuss what they know about the meaning of their word and write a definition on the paper. Rotate the groups until each group has visited every word poster.
- Review each word and the information about the word that students wrote on the paper. Create a definition based on students' knowledge and write it on the board.
- Explain to students that sometimes they will not find any context clues that define an unfamiliar word. Point out that a glossary or a dictionary is a good source to utilize to find the definition of a word. Review with them how to locate a word and its definition in both a dictionary and the glossary. Point out the similarities and differences between the two sources.
- Have a volunteer read the definition for each word from the glossary. Compare students' definitions with the glossary definitions. Use the comparison to modify the definition for each word on the board.

Set the Purpose

- Have students read the book to find out more about different types of vehicles. Remind them to answer the questions *who, what, when, where,* and *why* in their mind after reading each chapter.

During Reading

Student Reading

- **Guide the reading:** Give students their copy of the book. Have students read from page 4 to the end of page 10. Encourage those who finish before others to reread the text.
- Model summarizing important information in the second section ("What Is an Electric Car?"). **Think-aloud:** *I made sure to stop reading after the second section to summarize what I'd read so far. First, I thought about the information that answers the questions* who, what, when, where, *and* why. *Then, in my mind, I organized the important information into a few sentences. In this chapter, the author explains that an electric carriage was first invented in the 1830s by Robert Anderson, and that in 1842 Robert Davidson and Thomas Davenport created electric vehicles with replaceable cells. I will underline* 1830s, Robert Anderson, 1842, Robert Davidson, Thomas Davenport, *and* replaceable cells *in the book. Gaston Plante in 1865 and Camille Faure in 1881 created and improved upon the lead-acid battery, which had better storage capacity and was rechargeable. With the invention of the lead-acid battery, the popularity of the electric car increased. I will also underline this information in the book. Based on what I underlined, a summary of the section might be:* Robert Anderson invented an electric carriage in the 1830s. Robert Davidson and Thomas Davenport created electric vehicles in 1842 that had replaceable electric cells. Gaston Plante in 1865 and Camille Faure in 1881 created and improved upon the lead-acid battery, which had better storage capacity and was rechargeable. With this invention, the popularity of electric cars increased.

Have students turn to page 8 and reread the page. Have them work with a partner to underline important information in their book about early electric cars. Remind them to answer the questions *who, what, when, where,* and *why.* Point out that not every chapter will supply answers to all five questions. When they have finished, create a summary as a class. (For years, Great Britain and France were leaders in the development of electric vehicles. Then in 1891, U.S. inventors built an electric tricycle and an electric wagon, and America was hooked. In 1897, New York City bought electric taxis—each costing what would be at least $50,000 today.)

- Review with students the underlined information they marked in their book as they read pages 9 and 10 about cars powered by steam, electricity, and gas. Discuss any similarities and differences between gas-powered cars and electric-powered cars. (Similarities: both were popular in America; both afforded people greater mobility; inventors worked to improve both; both drove on the roads. Differences: electric cars didn't shake, gasoline cars did; electric cars didn't produce a pungent smell and loud noises, gasoline cars did; electric cars didn't require gears to be shifted, gasoline cars did; gasoline cars took longer to start, requiring a hand crank.) Add this information to the Venn diagram on the board. Save the diagram for future reference.
- **Check for understanding:** Have students read to the end of page 11 and underline important information about hybrid cars. Invite them to share the information they underlined. Have students create an oral summary of section four ("By Steam, Electricity, or Gas") with a partner. Invite students to share their summaries.
- Have students work with a partner to compare and contrast electric cars and steam cars, and write the information on a Venn diagram on a separate piece of paper. Discuss their responses.
- Have students read the remainder of the book. Remind them to answer the questions *who, what, when, where,* and *why* in their mind after reading each chapter.

Have students make a question mark in their book beside any word they do not understand or cannot pronounce. Encourage them to use the strategies they have learned to read each word and figure out its meaning.

After Reading

- Ask students what words, if any, they marked in their book. Use this opportunity to model how they can read these words using decoding strategies and context clues.

Reflect on the Reading Strategy

- Divide students into small groups. Assign each group one of two sections to summarize: "The Decline of the Electric Car" or "The Resurgence." Have each group discuss the information they underlined in their section. Have them use the information to write a summary of the section. When students have finished, share and discuss their summaries aloud.
- **Think-aloud:** *I know that summarizing keeps me actively involved in what I'm reading and helps me understand and remember what I've read. I know that I will remember more about the different ways to power a car because I summarized as I read the book.*
- Ask students to explain or show how the strategy of summarizing helped them understand and remember the information in the book.
- **Independent practice:** On a separate piece of paper, have students work independently to create a summary of their own. Have them reread pages 18 through 22 ("The Future of Electric Cars") and answer the questions *who, what, when, where,* and *why* as they summarize the final section of the book.

Reflect on the Comprehension Skill

- **Discussion:** Review with students the similarities and differences between gasoline cars and electric cars. Add any new information to the Venn diagram on the board. Discuss how the information is organized in the Venn diagram.

- **Check for understanding:** Have students provide examples of how hybrid cars and gasoline cars are alike and different. Record this information on a new Venn diagram on the board.
- **Independent practice:** Introduce, explain, and have students complete the compare-and-contrast worksheet by comparing fuel cells with gasoline (pages 18 through 20). If time allows, discuss their answers.
- **Enduring understanding:** In this book, you learned about many different inventions in the automotive world. The new inventions created improvements upon older ones, therefore making a better automobile. Today, people are still working to improve automobiles, discovering and inventing new things to add to the old. Now that you know this information, how do you feel about the ever-evolving world of invention? Is there something that you'd like to improve upon in the future?

Build Skills

Grammar and Mechanics: Complex sentences

- Write the following sentence on the board: *The girls are studying _____ they have a test tomorrow.*
- Have students read the sentence and suggest words that might belong in the blank to complete the sentence (because, since). Write these words on the board.
- Review or explain to students that a *conjunction* is a word *that connects two independent clauses or two parts of a sentence.* Give the following example: *I like to play at school and I like to read at school.* The first part of the sentence can stand on its own. Underline *I like to play at school.* The second part of the sentence can also stand on its own. *I like to read at school.* Explain that the word *and* is a conjunction—it connects the two sentences making them one sentence.
- Explain that when you have two clauses, or parts of a sentence, and one of those parts cannot stand on its own and one can, then you have an independent clause and a dependent clause. The independent can stand all by itself, but the dependent needs to be supported or helped. We connect the two sentences using a subordinating conjunction. These subordinating conjunctions join the parts of the sentence to form a complex sentence.
- List the following examples of subordinating conjunctions on the board (after, although, as, because, before, for, if, once, since, than, though, unless, until, when, which, while).
- Write the following sentence on the board: *These cells could not be recharged, which meant the power source had to be replaced often.* Have students identify the subordinating conjunction in the sentence (which).
- Underline the following part of the sentence: *These cells could not be recharged.* Explain that this part of the sentence is the *independent clause.* It does not need any help or support to be a sentence or to be understood.
- Circle the following part of the sentence: *which meant the power source had to be replaced often.* Explain that this part of the sentence including the subordinating conjunction is the *dependent clause.* Point out that even though both sentence parts contain a subject and verb, the dependent clause does not express a complete thought and is not a sentence that can stand alone.

  Check for understanding: Ask students to turn to page 7 in their book and locate the third sentence. Have students identify the conjunction (*When*), the independent clause (*a chemical reaction occurs and an electric charge is created*), and dependent clause (*When the acid eats away at the lead*). Discuss their responses.
- **Independent practice:** Introduce, explain, and have students complete the complex sentences worksheet. Discuss answers aloud after students finish.

Word Work: Hyphenated compound adjectives

- Review or explain that *adjectives* are words that describe nouns or pronouns. An adjective tells *which one, how many,* or *what kind.*

- Write the following sentence on the board: *Smelly, noisy traffic could have ended a long time ago.* Have individual students come to the board and circle the adjectives in the sentence (*smelly, noisy, long*). Then have them underline the nouns that each adjective describes (*traffic, time*).
- Tell students that some adjectives are hyphenated and that they are called *compound adjectives.* Write the following sentence on the board: *William Morrison built a six-passenger electric wagon.* Have a volunteer come to the board and underline the compound adjective (*six-passenger*). Have another volunteer underline the noun that the adjective describes (*wagon*). Point out that the word *electric* is also an adjective describing *wagon,* but it is not a compound adjective.
- Have students turn to page 13 and find the compound adjective (*high-volume*). Remind them to not confuse a hyphenated compound adjective with a dash used as punctuation. (Ford could sell his vehicles cheaply—to begin with, between $500 and $1,000.)

Check for understanding: Have students work with a partner to find and circle all the hyphenated compound adjectives in the book. Have them underline the noun that the adjective describes.

Build Fluency

Independent Reading

- Allow students to read their book independently. Additionally, allow partners to take turns reading parts of the book to each other.

Home Connection

- Give students their book to take home to read with parents, caregivers, siblings, or friends. Have them discuss with someone at home how to summarize as they read.

Extend the Reading

Informational Writing Connection

Provide print and Internet sources for students to research the effects of burning gasoline. Have them read to find out about the environmental ramifications of gasoline-burning cars—including the effect on our ozone, air quality, and the mining of natural resources—as well as any other interesting facts they may find. Have them write a report with at least three sections, including an introduction and conclusion. Have them create a table of contents and a glossary, and encourage them to add illustrations or photographs to their report. Require an error-free final copy with a front and back cover. If time allows, invite them to read their report aloud to the class.

Visit WritingA–Z.com for a lesson and leveled materials on informational writing.

Science Connection

Help students find more information about the lead-acid battery and its use of sulfuric acid and lead. Have students find out the properties of those two components and the ways they work together. Explain and, if possible, demonstrate the chemical reaction that occurs when the acid eats away at the lead, creating an electric charge. Discuss how that charge could power an electric motor of an automobile.

Skill Review

Discussion cards covering comprehension skills and strategies not explicitly taught with the book are provided as an extension activity. The following is a list of some ways these cards can be used with students:

- Use as discussion starters for literature circles.
- Have students choose one or more cards and write a response, either as an essay or as a journal entry.
- Distribute before reading the book and have students use one of the questions as a purpose for reading.

- Cut apart and use the cards as game cards with a board game.
- Conduct a class discussion as a review before the book quiz.

Assessment

Monitor students to determine if they can:

- accurately use details from the text to create section summaries during discussion and on a separate piece of paper
- compare and contrast nonfiction details within the text during discussion and on a worksheet
- correctly identify the parts of a complex sentence: subordinating conjunction, independent clause, and dependent clause
- identify hyphenated compound adjectives used in the text during discussion and in the book

Comprehension Checks

- Book Quiz
- Retelling Rubric