



LESSON PLAN

ELECTRIC SCHOOL BUS

This lesson plan is built using 8th-grade North Carolina standards. Please refer to a bridge or crosswalk tool to adapt this lesson plan to your state and/or grade level.

CLUSTER/STANDARD(S):

Mathematical Connections

8.EE.7: Solve real-world and mathematical problems by writing and solving equations and inequalities in one variable.

Literacy Connections:

RL.8.1 Cite textual evidence that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.

Writing Standards:

W.8.1 Write arguments to support claims with clear reasons and relevant evidence.

ELA Standards:

L.8.4 Determine and or classify the meaning of unknown or multiple-meaning words or phrases based on grade 8 reading and context, choosing flexibility from a range of strategies: context clues, word parts, word relationships, and reference materials.

Science Connections:

8.P.2.1: Explain the environmental consequences of the various methods of obtaining, transforming, and distributing energy.

8.P.2.2: Explain the implications of the depletion of renewable and non-renewable energy resources and the importance of conservation.

Social Studies Connections:

8.H.3.2: Explain how change is brought about by technology and how other innovations affect individuals and groups in North Carolina and the United States. (Examples: Advancements in transportation, communication networks, and business practices)

LESSON PURPOSE:

Conceptual Understanding
Skills and Procedures
Application

LESSON OUTCOMES:

1. Students will be able to identify and explain the difference between renewable and non-renewable energy sources.
2. Students will be able to read and interpret data to make informed decisions about justifying the purchase of new technologies.

MATERIALS:

RAFT Paper Template
3-2-1 Diagram Template
Opinion/Proof Template

CONTENT VOCABULARY:

Electric Vehicle Innovation
Energy Kilowatt
Fuel Cell Kinetic Energy
Grid

PROBLEM/SOLUTION JIGSAW:

Non-renewable Energy
Renewable Energy
Technology
Carbon Footprint

THE LESSON

BEFORE: ACTIVATE PRIOR KNOWLEDGE

Teacher will show pictures of the following: Windmill, Hydro-electric Dam, Subway, Steam Engine, Electric car, Nuclear Submarine, and Solar Field.

Students will participate in a Think-Pair-Share with a partner and answer the following questions by providing reasoning for the answers they provide:

1. What are examples of forms of energy? (Possible Answers: Solar, Wind, Water, Nuclear, etc.)
2. What is an example of a Green Energy? (Possible Answers: Electric Wind, Solar)
3. What are some examples of necessary transportation in our everyday lives? (Possible answers: School Bus, Freight Hauling, Personal, etc.)

Teacher will select students to share their responses to the whole class.

DURING: KNOWLEDGE ACQUISITION

Students will read portions of the non-fiction articles, [Why We Need to Transition to Electric School Buses published by the Electric School Bus Initiative](#), and annotate their section by marking the text for key features on the history of the automobile.

Students conduct a Jigsaw Activity:

- | | |
|--------------------|---------------------------------------|
| Group One | Introduction |
| Group Two | The Challenge |
| Group Three | The Need for Equitable Transportation |
| Group Four | The Electric School Bus Opportunity |

A member from each group will form a new group and take turns sharing their information so that each member can complete their Problem/Solution Jigsaw Activity.

Jigsaw Sections: (The sections below will be dependent on the article selected by the teacher.)

- What is the problem?
- What are the effects?
- What are the causes?
- What are the solutions?
- What is the significance?

PROJECT

DRIVING QUESTION

A local school wants to purchase a Thomas Built Buses Saf-T-Liner C2 Jouley Electric School Bus. To replace one of their older diesel versions. Your class has been assigned the task of collecting and analyzing the data to determine if the added cost is justified. **How will the students determine if the purchase of an electric school bus can be justified?**



Things to Consider

1. How many years will it take from the saved fuel cost to pay for the extra investment in an electric school bus?
2. Could enough money be saved from fuel costs and maintenance, compared to a traditional school bus, to justify the additional cost of the electric school bus?
3. How does the incorporation of incentive packages make purchasing an electric school bus more affordable?

Questions

1. How many miles will the car be driven each year?
2. What is the fuel consumption of the electric school bus? (miles per equivalent)
3. What is the fuel consumption of the diesel school bus? (miles per gallon)

Strategy

1. What is being measured on the axis?
2. What do the y-intercepts mean?
3. What is the significance of where the two lines intersect?
4. What does it mean when one line has higher y-values than the other line?

Information Needed

1. Price of the buses, both electric and diesel versions
2. The distance the buses are driven
3. The miles per gallon and miles per kilowatt of each bus
4. The cost of diesel per gallon

Resources

- [Total Cost of Ownership Calculator for Electric School Buses](#)
- [All About Total Cost of Ownership \(TCO\) for Electric School Buses](#)
- [Inflation Reduction Act of 2022](#)
- [All about the Clean School Bus Program](#)

TABLE 1

DATA NEEDED FOR TOTAL COST OF OWNERSHIP CALCULATOR

Using the total Cost of Ownership (TCO) Calculator under the Resources section of the Lesson Plan, students will use Table 1 (Below) to enter in the correct information and evaluate the results.



	JOLEY	DIESEL
TYPE	C	C
GVWR	33,000 lbs.	33,000 lbs.
CLASS	7	7
STATE	NC	NC
CHARGER	DCFC 50kW	Diesel
VEHICLE MILES TRAVELED	14,084	14,084
CITY MILES	55%	55%
AVERAGE ELECTRICITY PRICE	0.09	\$3.20 per gallon
CASH PURCHASE	Yes	Yes
YEARS OF USE	14	14
INCENTIVE	Current CSBP Priority	None

[Total Cost of Ownership Calculator for Electric School Buses](#)

AFTER: KNOWLEDGE RETENTION THROUGH FORMATIVE ASSESSMENT

Opinion/Proof Students will provide 5-pieces of evidence that prove the opinion TRUE or FALSE

Opinion

Electric School Buses are more cost effective to own long-term.

1. Evidence 1
2. Evidence 2
3. Evidence 3
4. Evidence 4
5. Evidence 5

Students will use their evidence to write an introductory paragraph that proves the opinion TRUE or FALSE.

RAFT Paper

Students will write a RAFT paper using their Jigsaw Worksheet as a guide. Each component listed below will be addressed in the RAFT paper.

1. Role of Author
2. Audience
3. Format
4. Topic

3-2-1 Diagram

Students will complete a 3-2-1 Diagram formative assessment as their Exit Ticket.

- 3 Things you learned
- 2 Things you thought were interesting
- 1 Question you still have

REFERENCES

[ReadingQuest | Main Page](#)

[All About Total Cost of Ownership \(TCO\) for Electric School Buses | Electric School Bus Initiative](#)

[All About the Clean School Bus Program | Electric School Bus Initiative](#)

[Why We Need to Transition to Electric School Buses | Electric School Bus Initiative](#)

[Inflation Reduction Act of 2022 Tax Credit for Qualified Commercial Clean Vehicles \(section 45W\) An Explainer v3.pdf \(electricschoolbusinitiative.org\)](#)

[Total Cost of Ownership Calculator for Electric School Buses | Electric School Bus Initiative](#)