System

Physical Science | Lesson Guide

1st Grade

Photo Description

This picture shows the inside of a car where the engine lives. The engine is a big machine with many parts that work together. There are tubes, wires, and metal pieces that help the car move.

Scientific Phenomena

The anchoring phenomenon here is mechanical energy transfer and conversion. The car engine converts stored chemical energy from gasoline into mechanical energy that makes the car move. This happens through a series of controlled explosions inside the engine cylinders, where fuel and air mix and ignite, creating pressure that pushes pistons up and down, which then turns the crankshaft and ultimately moves the wheels.

Core Science Concepts

1. Energy Transfer: Energy changes from one form to another - chemical energy in gas becomes motion energy
2. Simple Machines: The engine contains many simple machines like levers, wheels, and pulleys working together
3. Cause and Effect: When we turn the key and press the gas pedal, it causes the engine to start and the car to move
4. Systems: All the engine parts work together as a system to make the car function

Pedagogical Tip:

Use toy cars and have students push them to demonstrate how energy from their muscles transfers to make the car move. This concrete experience helps them understand energy transfer before discussing the more complex car engine.

UDL Suggestions:

Provide multiple ways for students to explore this concept: kinesthetic learners can use toy cars, visual learners can examine simple diagrams, and auditory learners can listen to engine sounds and discuss what they hear.

Zoom In / Zoom Out

1. Zoom In: Inside the engine cylinders, tiny explosions happen very fast when gasoline mixes with air and gets a spark. These mini-explosions push parts called pistons up and down.

2. Zoom Out: Cars are part of our transportation system that connects our whole community. The energy that powers cars affects our environment and air quality in our neighborhoods and cities.

Discussion Questions

1. What do you think would happen if we removed one important part from the engine? (Bloom's: Analyze | DOK: 2)
2. How is a car engine similar to your body when you run and play? (Bloom's: Apply | DOK: 2)
3. What other machines do you know that need energy to work? (Bloom's: Remember | DOK: 1)
4. If you could design a new way to power cars, what would you use and why? (Bloom's: Create | DOK: 3)

Potential Student Misconceptions

1. Misconception: "Cars move because they want to" or "Cars are alive"
   Reality: Cars are machines that need fuel and human control to operate

2. Misconception: "Gas goes directly to the wheels to make them spin"
   Reality: Gas burns in the engine to create energy that gets transferred through many parts to eventually turn the wheels

3. Misconception: "All the car parts work by themselves"
   Reality: All parts work together as a connected system

NGSS Connections

- Performance Expectation: 1-PS4-1: Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate
- Disciplinary Core Ideas: PS3.B - Conservation of Energy and Energy Transfer
- Crosscutting Concepts: Cause and Effect, Systems and System Models

Science Vocabulary

* Engine: The part of a car that burns fuel to make the car move
* Energy: The power needed to make things work or move
* Fuel: Something that burns to give energy, like gasoline
* System: Different parts that work together to do a job
* Transfer: When something moves from one place to another

External Resources

Children's Books:
- Cars and Trucks and Things That Go by Richard Scarry
- The Magic School Bus: Under the Hood by Joanna Cole
- From Here to There by Margot Apple

YouTube Videos:
- "How Car Engines Work - Simple Explanation for Kids" - Basic animation showing engine parts and fuel burning (https://www.youtube.com/watch?v=ZQvfHyfgBtA)
- "Sid the Science Kid: Simple Machines" - Explores how simple machines work together in complex systems (https://www.youtube.com/watch?v=jbpNqDe_Wws)