Hybrid Engines: What Makes Them So Cool

60 – 90 minutes

In this lesson, students are introduced to the subject of hybrid engines. After viewing an animation on how these engines work, students create their own demonstration of a hybrid vehicle using sounds and motions.

Objectives

- Students will discuss the science and engineering behind the hybrid engine.
- Students will identify the advantages of using hybrid vehicles instead of conventional gasoline-powered ones.
- Students will demonstrate how hybrid engines work by using sounds and motions.

Materials

None

Background

We live in a time where we have the technology to reinvent the engines that make our vehicles run while reducing their impact on the environment. Experimenting with different fuels, along with rethinking how we can acquire the energy to propel our vehicles, has led to the design of several different engine types. This lesson focuses on the hybrid engines that are currently available, such as the hybrid electric engine that is fast becoming a standard on the automobile market. Hybrid engines are found not only in our cars and trucks, but in buses and trains as well.

Advance Preparation

You will need computers with internet access for this lesson. Bookmark the following website for students: http://www.fueleconomy.gov/feg/hybridtech.shtml.

Do Now

Ask students the following questions: *How many of you know if your family drives a hybrid car or truck? What do you think it means to have a "hybrid" engine?*

Mini-Lesson

1. Tell students that, according to the U.S. Department of Energy, hybrid vehicles sales in 2010 were nearly thirty times what they were ten years earlier. In 2000, there were only two hybrid models available, and only about 9,000 vehicles were sold. By contrast, twenty nine hybrid models were available in 2010, and over 274,000 vehicles were sold.

2. Explain to students that they are going to learn more about hybrid engines, including how they work and how they differ from conventional gasoline-powered vehicles.
3. Place students in pairs and assign each pair to a computer. Have students load the following website: http://www.fueleconomy.gov/feg/hybridtech.shtml. Then have students click on the "How It Works" animation on the right side of the page.
4. Tell students they are going to work with their partner to explore the animation. They should begin with the "Overview" tab, and then move on to the other tabs, including "Starting," Cruising," "Passing," and so on. As they explore the animations, they should take notes by describing or drawing the components and processes that make the engine work.
5. Monitor pairs as they explore the hybrid engine animation. Depending on time and student interest, consider showing students the full hybrid animation.
6. Create a class drawing of the hybrid engine on the board. Invite volunteers to draw and label the outline of a car, the battery, the electric motor, and the gasoline engine. Invite additional volunteers to explain what they learned about how these components work together in the hybrid engine.

Activity

1. Explain to students that they are going to work as a class to create their own hybrid machine using their knowledge of how hybrid engines work. Students will use their bodies, sounds, and motions to represent specific parts of the hybrid vehicle.
2. To begin this activity, clear some floor space in the classroom so that students can stand together over the course of the exercise.
3. Invite one volunteer to come to the front of the room to represent one part of the hybrid engine, such as the battery. He or she should announce the part so it is clear to other students. Then, the student should position his or her body to look like that part and stand or sit in place in the designated space in the classroom. Once in position, the students should make a sound that represents the part. Encourage creativity, and invite students to offer suggestions.
4. Other students should continue to "build" the hybrid engine by adding their part to that of the first student. Students should join the first student, making sure they announce their part and make their sound as they position their bodies. Facilitate this process by inviting students, one person at a time, in intervals. Once all of the parts of the hybrid engine are represented, students can add other parts of the vehicle, such as doors, windows, tires, radios, and so on.
5. Once the class has built their mock hybrid engine, tell them that they are going to start up the car and have them make the appropriate sounds and motions. You can also have them cruise, pass, brake, and stop to represent the information they learned earlier in the animation.
6. Afterward, have students give themselves a round of applause. Debrief the experience by asking the following questions:
   - What was the most interesting or surprising thing you learned about hybrid engines?
   - What are the advantages of hybrid engines as a way to power our vehicles?

7. Wrap up the activity by having students list all the reasons why a hybrid vehicle might be a better choice for the environment and for the people who drive or drive in them. Invite volunteers to share their lists with the class.

Assessment

Have students complete an exit slip in which they answer the following two questions: *What do you know about hybrid engines that you didn't know before this lesson? If you knew someone who was buying a new car or truck, what reasons would you give them to encourage them to consider a hybrid?*

Modifications

- Pre-teach unfamiliar vocabulary concepts to ***English Language Learners***. Give them a list of important words from the lesson and have them work with a partner to create an illustrated glossary of terms. Each term should include a definition and a simple visual. Consider the following terms for this lesson: engineering, hybrid.
- Provide a template for taking notes to ***Learners Reading Below Grade Level*** for the Mini-Lesson. Consider giving pairs a blank outline, a graphic organizer, or cloze notes.
- Offer ***Students with Special Needs*** an alternative role for the Activity. Students can act as an "Engineer" to make sure the class accurately brings to life the hybrid engine diagram. Provide a copy of the hybrid engine diagram, and have the student(s) check off the parts as they are demonstrated by the students.
- Have ***Advanced Learners*** explore the animation on fuel cells at http://www.fueleconomy.gov/feg/fcv_PEM.shtml and follow the Activity procedures to model how the technology works.

Extensions

- Extend this lesson by having students research other engine technologies, such as electric engines. Have students share their findings by drawing an illustration of, or modeling, the engine. Consider having students start at this website: http://www.fueleconomy.gov/feg/evtech.shtml.
- Extend this lesson by conducting a short field trip to the parking lot to have students view an example of a hybrid engine. Have students discuss the similarities and differences to what they learned in the lesson.