



VOLUME 24, EPISODE 4 - 12 minutes

TRANSPORTATION: *Automotive Innovations*

SYNOPSIS

In recent years, automobiles have evolved in ways such as increased fuel economy, reliability, handling, and comfort. Automobile manufacturing is in a new era, focusing on safety while incorporating impressive new technologies to meet our transportation needs.

As the human population grows, more people and more automobiles are on the road. With more congestion and traffic, there is an increased likelihood of accidents. Automobile engineers are reacting by making our transportation options safer with extensive crash tests, monitoring cameras and accident avoidance systems.

CURRICULUM UNITS

- ENVIRONMENTAL SCIENCE
- PHYSICAL SCIENCE
- ENGINEERING

CAREER POSSIBILITIES

- AUTOMOBILE DESIGN
- ENGINEER
- MECHANIC
- SERVICE TECHNICIAN

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ETS1.A: Defining and Delimiting an Engineering Problem

Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them.

Grades K - 4

Science and Technology

Abilities of technological design
Understandings about science & technology

Grades K - 4

History and Nature of Science

Science as a human endeavor

Grades 5 - 8

Science in Personal and Social Perspectives

Science & technology in society

CRITICAL THINKING EXERCISES

1. Assign students into groups and ask them to choose a specific make and model of automobile. Ask them to identify safety features and discuss features that they imagine would improve the safety as well.
2. Discuss with the class what they think automobiles will be like 10 years, 25 years, and 50 years from now. How might autonomous vehicles impact driving habits? If autonomous vehicles become more like public transportation, how will this affect commuting? Brainstorm a list of pros and cons regarding how these changes in habits could impact the economy and the environment.
3. Discuss with students the steps the government is taking to encourage automobile manufacturers to improve their fuel efficiencies and emissions.

BACKGROUND

Recent automobile innovations are mostly geared at safety, both for the vehicles occupants and the environment as well. Automobile manufacturers are making cars smarter. They are no longer simply tools from traveling from point-A to point-B. Complex computer programs are being tested to make vehicle to vehicle communication possible. These algorithms calculate information to determine the best evasive measures when faced with an impending accident. In addition, more automobiles are coming equipped with cameras and sensors. Back-up cameras and lane changing alert system cameras and sensors are helping drivers avoid accidents and injury.

Autonomous cars might seem like things of the future, however, Nissan has been using artificial intelligence and global positioning systems to control their EPORO robots for some time now. The robots are modeled after the behavior of a school of fish, never touching one another, while avoiding obstacles. The robots are a stepping stone towards autonomous vehicles.

Alternative fuel vehicles such as the LEAF, run completely on electricity. The engine is much quieter than an internal combustion engine and, as a result, designers decided pedestrians needed some warning that the car was nearby and moving. The LEAF is equipped with a vehicle sounds for pedestrians system. To alert pedestrians, the blind, and others of its presence, the car is equipped with digital warning sounds, as a result of significant noise reduction due to fewer moving parts and no exhaust.

ADVANCED ORGANIZERS

Prior to viewing this video, students should have some understanding of the following Benchmarks for Science Literacy, Oxford University Press, which are excerpted and, in some cases, abbreviated below. Refer to the Benchmarks for more information.

Benchmark 3. THE NATURE OF TECHNOLOGY

Section A: Technology and Science, Grades 3-5

- Throughout all of history, people everywhere have invented and used tools. Most tools of today are different from those of the past but many are modifications of very ancient tools.
- Technology extends the ability of people to change the world: to cut, shape, or put together materials; to move things from one place to another; and to reach further with their hands, voices, senses, and minds. The changes may be for survival needs such as food, shelter, and defense; for communication and transportation; or to gain knowledge and express ideas.

Benchmark 8. THE DESIGNED WORLD

Section B: Materials and Manufacturing, Grades 6-8

- Manufacturing usually involves a series of steps, such as designing a product, obtaining and preparing raw materials, processing the materials mechanically or chemically, and assembling the product. All steps may occur at a single location or may occur at different locations.
- Efforts to find replacements for existing materials are driven by an interest in finding materials that are cheaper to obtain or produce or that have more desirable properties.
- Some materials, such as plastics, are synthesized in chemical reactions that link atoms together in long chains. Plastics can be designed to have a variety of different properties for a variety of uses.

VOCABULARY

Autonomous vehicles: Driverless or self-driving vehicles capable of sensing the environment via radar and GPS and navigating without human input. Autonomous vehicles exist mainly as prototypes and demonstration systems, but are likely to become more widespread in the near future.

Decibel: A unit used to measure the power of a signal, such as an electrical signal or sound, relative to some reference level. As a measure of sound intensity, a zero-decibel reference is stipulated to be the lowest level audible to the human ear; the speaking voice of most people ranges from 45 to 75 decibels.

Global positioning system: A system of satellites combined with receivers on the Earth that determines the latitude and longitude of a particular receiver through triangulation. The distance of the receiver to three of the satellites is ascertained by measuring the time-delay of a predetermined radio signal.

Lithium ion battery: Rechargeable battery in which lithium ions move from the anode to the cathode during discharge and back when charging. They use a lithium compound as the electrode material, compared to the metallic lithium used in non-rechargeable lithium battery.

Regenerative braking: Converts the energy generated by braking into electrical energy to charge the batteries for the electric motor portion of the propulsion system.

SUGGESTED REFERENCES

- *Safety tips and new safety related technology (U.S. Department of Transportation):* <http://www.safercar.gov/>
- *National Highway Traffic Safety Administration:* <http://www.nhtsa.gov/>
- *Consumer Reports – What’s next in Auto Safety:* http://www.consumerreports.org/cro/cars/car-safety/car-safety-reviews/whats-next-in-auto-safety-4-07/overview/0704_whats-next-in-auto-safety_ov.htm