

SMASH LAB

CO₂ Cop Car

Teacher's Guide



Grade Level: 9–12

Curriculum Focus: Science

Running Time: 41 minutes

Program Description

Kevin, Chuck, Deanne, and Nick consider the use of carbon dioxide to extinguish the engine of a car during a high speed police chase. The team must figure out how much CO₂ is needed to put out the engine, and how to get the CO₂ to reach the car.

Learning Objectives

After viewing the program and participating in discussion, students will be able to:

- Describe how carbon dioxide puts out a fire;
 - Understand the importance of research before experimenting;
 - Explain how a car engine works;
 - Identify how a control is necessary in an experiment to collect accurate data;
 - Consider how science experiments drive scientific progress.
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Classroom Connections

How do the different types of fire extinguishers presented in the program work? Which fire extinguisher stopped the engine the fastest?

What are halons, also known as haloalkanes? What are they most commonly used in? Why are many states banning their use?

What are some techniques police use to stop car chases? Why do cops rarely get in front of the criminal car during a chase?

How much CO₂ is needed to stop an engine? What are the major concerns with executing the team's plan?

What was the most effective deployment of CO₂ to a speeding car developed by the Smash Lab team? Does it work? What are some ways that the deployment plan would need to be reviewed before marketing the invention to the police?

Classroom Activities

Deanne is the only female member of the Smash Lab team. In fact, the ratio of men to women in science and engineering professions is very high. Students should hypothesize reasons why the profession is so one-sided. After coming up with possible reasons, students should research the Women in Science and Engineering (WiSE) programs. What is the WiSE program? Which universities offer this program? How does WiSE recruit women for this program? Students should try to find personal accounts of being a woman in a male-dominated profession. Students may also look up successful female engineers and their accomplishments.

Target Vocabulary*

carbon dioxide - a heavy colorless gas CO₂ that does not support combustion, dissolves in water to form carbonic acid, is formed especially in animal respiration and in the decay or combustion of animal and vegetable matter, is absorbed from the air by plants in photosynthesis, and is used in the carbonation of beverages

combustion - an act or instance of burning

deployment - to spread out, utilize, or arrange for a deliberate purpose

extinguish - to cause to cease burning

international combustion engine - a heat engine in which the combustion that generates the heat takes place inside the engine proper instead of in a furnace

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Academic Standards

National Academy of Sciences

The National Academy of Sciences provides guidelines for teaching science in grades K-12 to promote scientific literacy. To view the standards, visit this Web site:

<http://books.nap.edu/html/nses/html/overview.html#content>.

This lesson plan addresses the following national standards:

- Physical science
- Science as inquiry
- Science and technology
- Science in personal and social perspectives