

## SUGGESTED REFERENCES

- International Fire Service Training Association, Richard Hall and Barbara Adams **Essentials of Fire Fighting**, 1998, 4th Edition
- James G. Quintiere, **Principles of Fire Behavior**, International Thomson Publishing, 1998
- National Fire News*  
[www.nifc.gov/fireinfo/nfn.html](http://www.nifc.gov/fireinfo/nfn.html)
- Fire Challenge Crew: The Fire Triangle*  
[www.hantsfire.gov.uk/kids/learn/firetriangle.html](http://www.hantsfire.gov.uk/kids/learn/firetriangle.html)
- The United States Department of Homeland Security, U.S. Fire Administration for Kids: Home Fire Safety*  
[www.usfa.fema.gov/kids/flash.shtm](http://www.usfa.fema.gov/kids/flash.shtm)

## NATIONAL SCIENCE EDUCATION STANDARDS

**K - 4**

### Physical Science

Properties of Objects and Materials

### Science in Personal & Social Perspectives

Types of Resources

**5 - 8**

### Physical Science

Transfer of Energy

### Science in Personal & Social Perspectives

Natural Hazards

\*Source: *National Science Education Standards, 1996, National Academy Press*

## CREDITS

The producers thank Channel 4 Television Corporation/4 Learning & Barricade Gel for materials used in this program.

### EDUCATOR ADVISORY PANEL

Fred Barch, M.S.  
Rose-Marie Botting, M.S.

Debra A. Murnan, B.A.  
John A. Murnan III, M.S.

### PRODUCTION CREDITS

WRITER/PRODUCER:  
ASSOCIATE PRODUCER:  
EDITOR:  
NARRATORS:

Megan Chaney  
Patricia Norman  
Jon Glassman  
Cyrilla Baer Pond & Joshua Forman

# SCIENCE SCREEN REPORT FOR KIDS®

*Science Brought To Life In The Classroom*

SCIENCE SCREEN REPORT FOR KIDS is a proud participant in the Presidential Awards for Excellence in Mathematics and Science Teaching. For more information visit [www.nsf.gov/pa](http://www.nsf.gov/pa)

1000 Clint Moore Road, Suite 211, Boca Raton, FL 33487  
tel: 1.800.232.2133 email: [info@ssrvideo.com](mailto:info@ssrvideo.com)  
[www.ssrvideo.com](http://www.ssrvideo.com)

COPYRIGHT © 2005 Allegro Productions, Inc. All rights reserved.

# SCIENCE SCREEN REPORT FOR KIDS

VOLUME 15 ISSUE 3

## UNDERSTANDING THE FIRE TRIANGLE



Accreditation Board  
for Engineering  
and  
Technology



Presidential Awards  
for Excellence in  
Mathematics  
and  
Science Teaching



Junior Engineering  
Technical Society  
[www.jets.org](http://www.jets.org)

## SYNOPSIS

Across the United States a house or building fire is estimated to occur every minute, and there are 640,000 wildfires a year. Fires are dangerous and can be deadly - an important reason to learn about fires and how to prevent them. For example, have fire alarms in your house and have an evacuation plan.

This program investigates the nature of fire and the elements that create it. In order for a fire to burn, all elements of the fire triangle need to be present. The fire triangle consists of heat, fuel, and oxygen. Firefighters demonstrate how to put out different types of fires, including an example of why you should never put water on an oil fire. Firefighters also show how using a thermal imaging camera helps to identify the source of a fire.

## CURRICULUM UNITS

- CHEMISTRY
- ECOLOGY
- ENVIRONMENTAL SCIENCE
- PHYSICAL SCIENCE
- PHYSICS
- PUBLIC HEALTH

## RUNNING TIME

17:43

## BACKGROUND

We have been using fire for our benefit for millions of years. Before there were ovens to cook our food, people used fire. Because of the danger of fire, people learned when using fires they need to take safety precautions. Understanding the nature of fire and how to control it is the goal of scientists all over the world.

This program provides an excellent demonstration of the fire triangle. The triangle consists of a heat source, fuel, and oxygen. The video shows how the gasoline vapors react with the flame to burn, while the liquid gasoline does not burn. Teachers can use this to show how the fire itself will become a chain reaction as the heat from the fire causes more of the liquid gasoline to vaporize and then react with the flame.

A couch set on fire shows how quickly a fire can spread from the source to the surrounding area. Knowing the elements of the fire triangle, firefighters and scientists use specific techniques to stop each kind of fire. To control most fires, firefighters remove the source of heat that is creating the energy for the chain reaction. This usually involves putting water on the fire. Spraying enough water on a burning object will reduce the heat and eventually extinguish the flame.

Scientists have developed a special thermal imaging camera to allow firefighters to find the source of the fire so that water can be directed onto it. This camera allows the firefighter to see through the smoke and find the source by looking for the hot spot. Once the hot spot is found, the water can be directed onto it.

Scientists have discovered that the polymer used in baby diapers to absorb water can also be used to protect things from burning. The polymer is a gel consisting of water filled bubbles. Spray it on something and it keeps the heat from reaching the fuel. Students can see where a corner of a house sprayed with the gel did not burn when a fire spread through the area.

Some fires should not be extinguished using water. Burning oil reacts explosively with water and placing just a small amount of water on an oil fire can cause it to splatter, carrying the flames with it. This is shown in the video with a dramatic demonstration. Taking away the oxygen instead of the heat puts out oil fires. A firefighter takes the same oil fire and places a fire blanket over it. The fire goes out almost instantly.

We use fire to our benefit every time we get into a car. In the video students are shown how a car's engine works. An internal combustion engine uses a spark of flame and gasoline to power the motor.

Scientists study the ways that fire can be controlled which has allowed us to reduce the number of deaths and injuries that result from accidental fires. Firefighters are constantly working on new ways to attack fires. The development of the thermal imaging camera and the fire resistant gel are just two examples of the science of fighting fires.

## ADVANCED ORGANIZERS

Prior to showing 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 8: The Designed World

#### Section B - Materials and Manufacturing

Know by the end of Grade 5

- Through science and technology, a wide variety of materials that do not appear in nature at all have become available.
- The choice of materials for a job depends on their properties and how they interact with other materials.

#### Section D: The Structure of Matter

- All matter is made up of atoms, which are far too small to see directly through a microscope.

\*Benchmarks can be found at [www.project2061.org/tools/benchol/bolintro.htm](http://www.project2061.org/tools/benchol/bolintro.htm)

## CRITICAL THINKING EXERCISES

- Discuss the four safety measures for home fire safety: 2 ways out of every room; fire alarm in every room; meeting place outside the home; know the phone number for the fire department.
- For homework, have students and their parents draw a map of their home with a fire evacuation plan.
- What are the three elements needed for a fire to burn? Draw and explain the fire triangle.
- Why does gasoline ignite so easily? Why doesn't diesel fuel ignite as quickly as gasoline?
- Describe three ways in which firefighters can extinguish fires. Why does one type of fire have to be extinguished differently from another type?
- How are fire sparks used to drive an engine of a car?

## VOCABULARY

- Back draft** . . . . . A condition in a fire where oxygen is depleted and the fire dies down until a door is opened and the fire flares violently from the intake of oxygen.
- Carbon dioxide** . . . . . A colorless, odorless, incombustible gas, also used in fire extinguishers.
- Carbon monoxide** . . . . . A colorless, odorless, highly poisonous gas, CO, formed by the incomplete combustion of carbon or a carbonaceous material, such as gasoline.
- Controlled burns** . . . . . When firefighters burn away ground litter that is potentially flammable and can fuel a fire caused by natural means like a lightning strike.
- Fire blanket** . . . . . A blanket used to smother a fire by removing the oxygen supply.
- Fire break** . . . . . During a forest fire it removes all the fuel from the area toward which a fire is heading.
- Fuel** . . . . . Something consumed to produce energy.
- Heat** . . . . . A form of energy associated with the motion of atoms or molecules.
- Hydrocarbons** . . . . . Any of numerous organic compounds, such as benzene and methane that contain only carbon and hydrogen.
- Ignite** . . . . . To cause to burn or set fire to.
- Molecules** . . . . . The smallest particle of a substance.
- Oxygen** . . . . . An element constituting 21 percent of the atmosphere that is required for nearly all combustion.
- Vaporize** . . . . . To convert or be converted into vapor.

## CAREER POSSIBILITIES

- CHEMIST
- ECOLOGIST
- FIRE FIGHTER
- FIRE SCIENTIST