Eye Wonder

S.C. Standards & Classroom Activities for Eye Wonder Firefighter

http://media.knowitall.org/content/firefighter-eye-wonder-0
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Standards need to be updated.

Grade 4

**Standard:** IV.B.1.a

Recognize that electricity is a form of energy and can produce heat and light.

**Type of Activity:** Pre-video discussion

**Introduction**- Students will need to understand how electricity in houses can cause fires. The purpose of this discussion is to introduce students to one of the types of fires that can be caused by electricity. This is then followed with the video to illustrate how firefighters are trained and why fire safety is important.

**Background:** Electrical fires are caused at home by loose or frayed wiring, usually within the walls or at the wall sockets. They can also be caused by poorly insulated wiring. Exposed wires can develop shorts that cause sparks. When these happen within walls, the spark can ignite the insulation in the wall or the wooden frame that supports the wall. Any flammable material near a wall socket with a short in it can also catch from a spark. If the insulation is poor, the heat generated by the electricity as it passes through the wire can also cause flammable materials to ignite. As an
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electrical current passes through a conductor, heat is built up, depending upon how much electrical resistance the conductor has.

A conductor is a material that easily transfers an electrical charge. Several metals are excellent conductors and are therefore used in wiring. Such metals include copper, aluminum, silver, and gold. A poor conductor is an insulator, something that transfers electrical charges very poorly, including wood, rubber, and plastic. Wires heat up when an electrical current is passed through them as a result of the metal's resistance to the flowing charge. If the wire is poorly insulated against heat, this hot wire can ignite flammable surfaces nearby, especially when inside a wall with insulation and wood.

Activity: How much heat is generated by different metal wires?

This activity is suggested as a demonstration to be done by the teacher.

Materials: Battery (the kind used in outdoor camping lamps), a short length of copper wire, a short length of aluminum wire, two insulated wires with metal clamps on their ends, Ohms meter, thermometer, timer

Procedure:

1. Attach one of the insulated wires to each of the battery terminals.

2. Then clamp the other ends to the length of copper wire to complete a simple circuit.

3. Clamp the Ohms meter to the copper wire and record the resistance.
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4. Place the end of the thermometer on the wire to record the increase in temperature. Watch this very carefully so that the temperature does not rise too fast to burst the thermometer. Record the time it takes for the temperature to rise.

5. Change wires and record the different resistance and rate of temperature increase of the different materials.

Follow-up: Watch the Eye Wonder segment.
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Grade 6-8

Standard: I.A.2.a. (6th/7th/8th)

Recognize potential hazards within a scientific investigation and practice appropriate safety procedures.

Type of Activities: Follow-up Discussion/Evaluation

Introduction- After watching the video, students will compare the safety equipment used by the firefighter with safety procedures used in the lab. This can take the form of an open class discussion or with each student writing his or her response and turning it in for a grade.

Background: In the lab, students need to practice specific safety guidelines in order not to have an accident. These include: keeping their hair tied behind them and not hanging loose (if one's hair is long), wearing closed toed shoes instead of sandals, wearing long pants to protect their legs, not wearing loose fitting clothing, wearing goggles to protect their eyes, and wearing a lab coat to protect their skin and clothing. Firefighters need to wear very specific equipment when fighting fires to protect them. These include: boots to protect their feet from broken glass and other debris, a heavy, insulated jacket and pants to protect against flames and extreme heat, gloves to protect their hands from heat and fire, a head piece to protect their face and hair from burning steam, fire, and heat, a helmet and
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face plate to protect their heads and eyes from falling debris and fire, and an oxygen tank to provide air while in a smoke-filled environment.

**Activity:** Similarities in safety.

This activity is a follow-up in order to evaluate the students after the video.

**Materials:** none.

**Procedure:**

Students will need to compare and contrast the safety procedures followed in classroom lab clothing with those taken by firefighters. They should include the reason each precaution is taken, both in the lab and by the firefighter and a detail of the similarities and differences between them.

**Modifications:** This can either be done as a post-video discussion involving the entire class or as a writing assignment, which will also test their writing skills, critical thinking skills, and ability to evaluate and compare prior knowledge with new information.
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Grade 6-8

**Standard:** I.C.3.a. (6th/7th), I.D.3.a. (8th)

Explain how science and technology are essential to each other.

**Type of Activities:** Solo Internet Research after watching the video

**Introduction** - After watching the video, students will use the Internet to do research and learn about how mathematics, physics, and chemistry are all necessary skills for a firefighter to use. They will then present their findings in a short reports that summarizes their research, as well as printing out the pages they obtained the information.

**Background:** Math, Chemistry, and Physics are all necessary skills for a firefighter.

**Physics** is used to determine the amount water pressure necessary to power the hoses used to extinguish the fire. Without the proper amount of water or **hydraulic pressure**, the water will not flow from the hose with enough force to put out the fire.

**Mathematics** is also used for this same reason: the equations for determining the amount of hydraulic pressure require math to solve them. The pressure gauges on fire trucks that let the firefighter know if they have enough pressure are designed based on this information and a firefighter needs to know at what point he or she is running low on pressure.
Chemistry is used for two main reasons. Certain types of chemicals can start fires and a firefighter needs to know what chemicals are dangerous and under what conditions certain chemicals will ignite. Chemical and electrical fires cannot be extinguished with just water. In such cases, chemical foams are used to put out the fire. The fire fighter needs to know not only what types of chemicals can cause fires and burn, but also what chemicals are used to extinguished such fires.

Activity: What kind of education is necessary to become a firefighter?

This activity is an Internet research project. It does not provide suggested web pages to begin with, as students need to learn how to do research on their own. If you would like to provide web sites for your students to use for this, contact your local fire department for suggestions.

Materials: Computer with Internet access.

Procedure:

1. The student will use the computer to learn why mathematics, chemistry, and physics are necessary skills for a firefighter.
2. The student will present this information in a short paper along with a copy of the web pages he or she obtained the research

Modifications: You may want to allow the students to use additional avenues of research, such as books and interviews to gather their information.
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Grade 6


Relate insulating factors to real life applications (e.g., building construction, clothing, animal covering).

Type of Activities: Lab

Introduction- After watching the video, students will conduct a lab in which they will demonstrate how different materials can provide insulation from a heat source. This is used to see how the thick material of the firefighter's clothing is used for protection.

Background: The clothing of a firefighter is made of material that is fire resistant and also provides insulation from the extreme heat the firefighter must endure. Different materials are resistant to heat. Heat is one type of transfer of kinetic energy from one place to another. When you touch something and it feels hot it is because your skin is at a lower temperature than the hot object. Different materials will increase or decrease in temperature at different rates. Water, for example, take a great deal of energy to raise its temperature whereas many metals will increase in temperature very quickly. This is why the metal spoon you place in a pot of boiling water very quickly heats up even though it took several minutes for the water itself to reach its boiling point. Thermal insulators are materials that are difficult to raise or lower the temperature of.
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Activity: How different materials resist heat.

This activity is a lab that follows the video and demonstrates how different materials can be used to insulate from heat.

Materials: 200-watt light bulb and lamp, 4 thermometers, glass beaker filled with water, thick cloth material, aluminum foil, timer.

Procedure:

1. Students will place one thermometer next to the light bulb, then place one other in the beaker of water a few inches from the light bulb. Wrap one thermometer in the heavy cloth and place it a few inches from the bulb. Wrap the final thermometer in the aluminum foil and place it a few inches from the bulb. Record the temperature of each bulb as time zero.
2. They will then turn on the light and begin recording the temperature every two minutes for 10 minutes, careful not to move them from the bulb or the temperatures will begin to drop.
3. Turn off the light bulb and record the temperatures for every two minutes for another 10 minutes.
4. Graph this information as a line or bar graph. (I.A.7.b. and I.A.2.f&g)

Follow-up: Ask students to tell why this demonstrates why the air over a lake or river is cooler than the air during the day and warmer than the air during the night.
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Grade 8

Standard: I.C.1.a&b.

Identify a specific need for a product (a)

Determine whether the product will meet the needs and be used (b)

Type of Activities: Pre-activity Brain storm and Follow-up Evaluation

Introduction- Before watching the video, the students will work in small groups to come up with a design for safety equipment to be worn by a firefighter. Then, after watching the segment, they will evaluate their own design by comparing it with the description of the firefighter's gear in the video.

Background: Firefighters need to wear very specific equipment when fighting fires to protect them. These include: boots to protect their feet from broken glass and other debris, a heavy, insulated jacket and pants to protect against flames and extreme heat, gloves to protect their hands from heat and fire, a head piece to protect their face and hair from burning steam, fire, and heat, a helmet and face plate to protect their heads and eyes from falling debris and fire, and an oxygen tank to provide air while in a smoke-filled environment.

Activity: The Perfect Firefighter's Outfit.
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This is a group brainstorm activity that will test the student's ability to design a product without prior information from the video.

**Materials:** none

**Procedure:**

1. Students will work in small groups to come up with a design for a firefighter's outfit that can provide them with the maximum amount of safety while sacrificing minimum movement. The instructor may wish to give the students some of the environmental conditions they may need to consider in their design, such as smoke, extreme heat, debris, steam, etc...

2. Have one student in the group draw the gear.

3. Following the video, the students will compare their designs with the description of the outfit actually used. They will report on how different or similar their design was to the one from the video, as well as recommendations for modifications to their own designs.

**Follow-up:** Instructors may wish to follow-up with the activity comparing the firefighter's gear with lab safety precautions (I.A.2.a).
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Credits

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