



## Fire Prevention and Safety 3-5

### Fire and Fire Prevention

## LESSON PLAN 1

# Fire Science

Fire is uncontrolled burning. All fires start with ignition, which occurs when sufficient levels of fuel, heat and oxygen (the fire triangle) exist simultaneously, and the temperature rises high enough to produce a flame. A chemical reaction takes place when all the elements of the fire triangle are present.

### Key Terms and Concepts

combustion	fuel	potassium chlorate
extinguish	heat	red phosphorus
fire triangle	lighter	safety match
friction	oxygen	

### Purpose

To introduce the students to the components of fire and how they interact, and to teach them how they can use this information to prevent fires

### Objectives

The students will—

- Name the three elements of the fire triangle and compare matches to the fire triangle to understand how they make fire.
- Analyze pictures on *Extinguishing the Match* to show how removing any of the sides of the fire triangle will extinguish a match.
- Create a list of rules for the use of matches and lighters.
- Share the class list Rules for the Use of Matches and Lighters at home and modify it according to their families' guidance. (Home Connection)
- Research the history of matches and lighters to create a time line illustrating the history of matches. (Linking Across the Curriculum)
- Extend the time line of the history of matches into the future. (Linking Across the Curriculum)
- Include on the time line opinions on matches, their best use and the direction taken in the development of matches. (Linking Across the Curriculum)
- Become acquainted with fire idioms and adages and write fables to explain one or more of the adages on the list. (Linking Across the Curriculum)
- Analyze news stories about home fires, using *Fire in the News* as a guide.



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- Write news stories about an imaginary, human-made fire, using information from *Fire in the News*.
- Analyze the connection between information about the fire triangle and the prevention of fires.
- Work together to write a simple one- or two-sentence message to sum up the most important rules for the use of matches and lighters. (Linking Across the Curriculum)
- Translate the rebus message on *The Secret Fire Message*. (Linking Across the Curriculum)
- Write another secret fire message in rebus format describing the most important thing to remember about the use of matches or lighters. (Linking Across the Curriculum)
- Share with their families the rebus messages created and translated in school. (Home Connection)

### Activities

“How Does Fire Work?”

“Harmful Fires”



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### Materials

- Safety matches
- Lighter (optional)
- Pie plate of water
- *Letter to Parent or Guardian*, 1 copy per student
- *Extinguishing the Match*, 1 copy per student



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## "How Does Fire Work?"

SET UP 15 minutes CONDUCT two 45-minute sessions

Science: Physical Science; Language Arts: Writing

**TEACHING NOTE** Before beginning the lesson, send home *Letter to Parent or Guardian* to let the family know that you will be discussing matches and lighters and how they work as the class begins to study fire and fire safety. If your school prohibits teacher demonstrations using matches and lighters, you can easily adapt the activity by using pictures of matches or lighters.

1.  Draw a triangle on the chalkboard or poster paper. At the top of the triangle write the term "combustion." Explain to the students that combustion occurs when something burns.
2. Tell the students there are three elements needed to produce combustion. What do they think those elements are? Guide them in a brainstorm session until they reach the conclusion that the three elements are fuel, heat and oxygen. Write the names of these elements along the sides of your triangle, one word per side.
3. Ask them to help you list sources for each element in the combustion, or fire, triangle and add them to your diagram.  
Answers will vary, and may include—
  - Heat: a lit match, heat from a furnace, a cigarette, etc.
  - Oxygen: the air
  - Fuel: wood, fabric, paper, etc.
4. What do they think would happen if any one of the triangle's sides were removed? Make sure they explain their ideas. Write their responses next to the triangle.  
Students' answers will show an understanding that any fire would go out without one of the three elements.
5. Now, light a safety match for the students. Why do they think the match was able to ignite? What was the source of heat? Fuel? Oxygen? Extinguish the match in the pie plate of water.  
**Answers**
  - The heat from the friction of striking the match on the safety strip creates a spark, raising the temperature of the match head and resulting in a cloud of smoke and phosphorus vapor. The vapor has an ignition temperature of 446° F (230° C) and bursts into flame, setting fire to the wood of the match.
  - The first source of heat is friction.



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- The source of fuel is the combination of chemicals in the striking strip (phosphorus sesquisulphide, or red phosphorus) reacting with chemicals in the match head (potassium chlorate). The second source of fuel is the wood of the match.
- The source of oxygen is the air.

6. Now, try the same thing with a lighter. Based on your demonstration and discussion of matches, invite the students to try to work out how the lighter works.

### Answers

- The source of heat is friction created when the serrated, hard-steel wheel strikes the “flint” mechanism and creates a spark. Particles derived from the “flint” are detached with sufficient energy that they burn in the air. The “flint” is a mixture of rare-earth and similar metals (mostly cerium).
- The source of oxygen is the air.
- The source of fuel is butane delivered by pneumatic gas. Butane, compared with red phosphorus and potassium chlorate, has a somewhat high ignition temperature 896° F (480° C). When you pull the mechanism that strikes the flint, butane rises into the air. As long as you hold the mechanism down, butane will be supplied and will continue to burn.

7. Finally, invite students to discuss ways to extinguish the flaming match.

Ask—

- What side of the triangle was removed when you dropped the match into the water? Explain.
- How would you remove one or more sides of the match’s fire triangle?

8. Give each student a copy of *Extinguishing the Match* and have them explain which side of the match’s fire triangle is removed in each picture.

### Answers to *Extinguishing the Match*

- Putting the match in water eliminates the heat source.
- Blowing on the match removes the heat source from the fuel.
- Shaking the match removes the heat source from the fuel.
- Dropping the match onto a noncombustible surface allows the match to burn until the fuel is used up.
- Putting the match into sand smothers the fire by removing the supply of oxygen.



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## LESSON PLAN 1 Fire Science



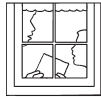
### Wrap-Up

Ask the students to share any rules their families have for the use of matches and lighters and list them on the chalkboard. Have the students review the list and determine the rules that are important to everyone. What rules would they add, if any? Make sure their rules include—

- Under what conditions matches can be used.
- Under what conditions matches cannot be used.
- Who can be allowed to use matches.
- Who cannot be allowed to use matches.
- What you will do if you find matches or lighters around the house, in a friend's house, or other places.

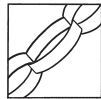
Work as a class to finalize the wording for each rule. Remind the students to use positive rather than negative wording and to keep each rule short, simple and clear.

When the class list is completed, have the students make and illustrate copies of their Rules for the Use of Matches and Lighters to post as appropriate.



### Home Connection

Have the students take home the Rules for the Use of Matches and Lighters to share and modify according to their families' guidance.



### Linking Across the Curriculum

#### Social Studies: History

Invite the students to work in small groups to research the history of matches and lighters. They can use the Internet and the local library as research sources. Help them create a time line to illustrate the history of matches and lighters and have them share their research with the class. Ask them to include their own opinions on matches, their best use and the direction the development of matches took. Are safety matches really safe? Why or why not? What would they like future inventors to add to their time line in the years to come? Explain.



#### Language Arts: Writing and Vocabulary

Many idioms and adages use fire imagery. Share only a few (see below) to prime the pump of the students' imaginations, and then give them 24 hours to find as many fire idioms and adages as possible to add to the list.

#### Fire Idioms:

add fuel to the fire	put out fires	to be fired
fan the flames	out of the frying pan	to get a person
fire fight	and into the fire	fired up
hot stuff	throw water on a fire	too hot to handle
light a fire under someone	to be burning up	turn up the heat



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## LESSON PLAN 1 Fire Science

Share the following fable:

A woman is carrying a basket of eggs. While she is walking, she begins to think about all the chicks she will soon have from her eggs. She imagines how much money she will make by selling the chicks and the things she will buy with all the money. Unfortunately, she is so lost in her daydreams that she trips and drops her basket of eggs, breaking them all! She is left with no eggs, no chicks, and no way to realize her dreams. This fable demonstrates the adage “Don’t count your chickens before they hatch.”

Challenge the students to make up their own “fables” about the origin of one or more of the fire idioms or adages on the class list. Share their stories in class and encourage the students to use their idioms and adages in other stories and conversations.



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## LESSON PLAN 1

### Fire Science

#### Materials

- One news story on a home fire
- Enough news stories about home fires for 5-6 student teams
- *Fire in the News*, 1 copy for each group
- *The Secret Fire Message*, 1 copy per student group (Linking Across the Curriculum)



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## "Harmful Fires"

SET UP 15 minutes CONDUCT two 45-minute sessions

### Language Arts: Media Literacy and Writing

1. Ask the students to define the concept of a harmful fire. How does it differ from a useful fire? What kinds of harm can out-of-control fires cause? (Answers will vary but the students will understand that harmful fires include house or apartment fires and wildland fires. Such fires leave people homeless and without any of their possessions from clothing to mementos to important legal documents.)
2. Read aloud the news story on a home fire. Ask:—
  - **Who** was responsible for causing the fire? Calling for help? Putting it out? Saving lives or property?
  - **What** happened to cause the fire, and what did the fire destroy?
  - **Where** did the fire take place?
  - **When** did it happen?
  - If using a match or lighter caused the fire, **why** was the match or lighter lit in the first place, and **how** did it cause a harmful fire?

Discuss the writing style of the article. Is there a bias? How are the facts presented? Objectively? Sensationally? Is the vocabulary clear and easy to read?
3. Divide the students into small groups and distribute copies of *Fire in the News* and news stories about home fires to each group. Have them read the articles to find the answers to the questions on Fire in the News for each article.
  - **Who** might be responsible?
  - **What** happened to cause the fire, and what did the fire destroy?
  - **Where** might such a fire take place?
  - **When** could it have happened?
  - **Why** was the match or lighter lighted in the first place, and **how** did it cause a harmful fire?
4. Now, challenge student groups to imagine a home fire that was started with a lit match or a lighter and then collaborate on a news article about that imaginary fire. Tell them to include information about the fire triangle:
  - What was the source of heat?
  - What fuel burned?
  - How was the fire suppressed?

Remind them to answer all the newsworthy questions: Who, What, Where, When and Why. Tell them to use the articles they analyzed as models for their own reports.



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## LESSON PLAN 1 Fire Science

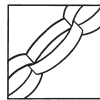
5. Have the groups exchange the first drafts of their articles. Each group must edit another group's article, using the information on *Fire in the News*, information about the science of fire and information about writing mechanics and style.



### Wrap-Up

Ask students to explain the connection between the fire triangle and harmful fires.

- How can understanding the science of fire help people prevent fires in their homes?
- Do the students' news articles on house or apartment fires provide this information? Explain.



### Linking Across the Curriculum

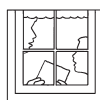
#### Language Arts: Reading, Writing (for younger students)

Discuss with the students a simple one- or two-sentence message they think sums up the most important rules for the use of matches and lighters. Next, discuss the meaning of rebus stories. Distribute *The Secret Fire Message* to small groups of students and have them work together to solve the rebus puzzle.

#### Answers to *The Secret Fire Message*

Destructive fires happen when kids play with fire. Playing with matches and lighters is not an accident. It's a choice you make. When you play with matches and lighters you put yourself and others in danger.

After they have worked together ask them to share what they think is the secret message. Challenge them to determine the most important thing to remember about the use of matches or lighters and write their own secret rebus message. Have groups exchange their completed rebus puzzles, and give them time to decode the secret rebus messages.



### Home Connection (for younger students)

Duplicate each of the rebus puzzles and send them home with the students to share with their families.



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# Letter to Parent or Guardian

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Name \_\_\_\_\_

**Dear Parent or Guardian,**

Our class will be doing activities on fire and fire safety. We will begin with the three elements needed to make a fire—oxygen, fuel and heat. We will be using matches to see how those three elements, known as the fire triangle, work together. During our discussion, we will also talk about how to extinguish a fire by removing one of the “sides” of the fire triangle as it applies to matches. The actual handling of matches will be done by adults and never by the children.

We will not suggest to your children that playing with matches is a good idea. Rather, we will stress the importance of understanding the science of fire and how to use this understanding to stop or prevent fires. We will discuss matches and safety and stress to the children that matches are tools, not toys, and only responsible adults should use them. We want children to understand that, if they see matches or lighters in or around their homes, playgrounds or school, they should report their discovery to adults.

Please talk with your children about your rules for the use of matches or lighters in your home. Be sure they understand the importance of following your rules and staying away from matches at all times.

Thank you,

\_\_\_\_\_  
(Teacher)

-----  
\_\_\_\_\_  
has my permission to participate in the fire triangle activity.  
(name of student)

\_\_\_\_\_  
does not have permission to participate in the fire triangle activity.  
(name of student)

\_\_\_\_\_  
(Signature of parent or guardian)

\_\_\_\_\_  
(Date)



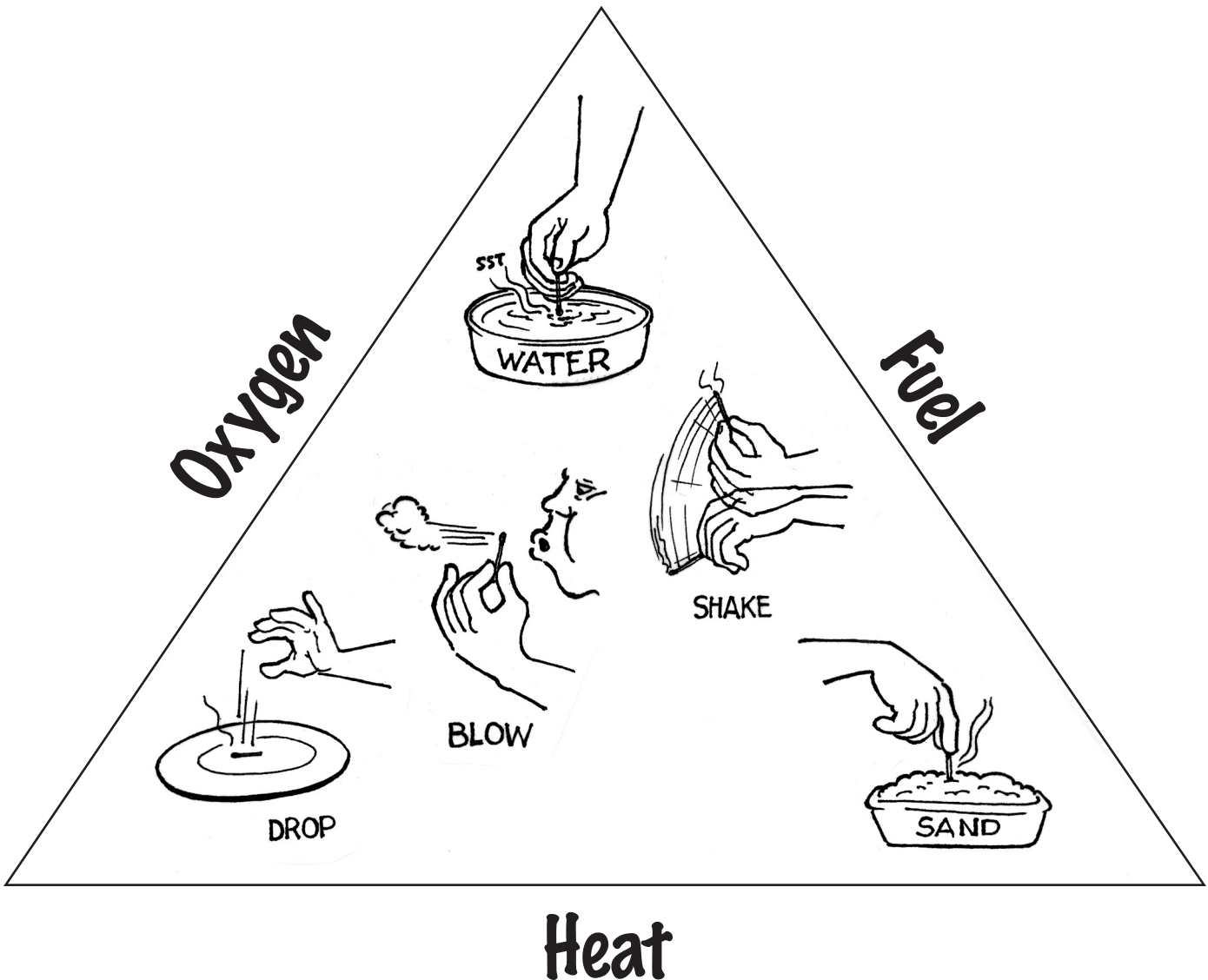


# Extinguishing the Match

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Name \_\_\_\_\_

**Directions:** Look at the pictures below. In each picture, one side of the fire triangle has been “removed” in order to put out the match. Draw lines from each picture to the side of the triangle that has been removed. Be prepared to explain your choices in a class discussion.





# Fire in the News

Page 1 of 1

Name \_\_\_\_\_

**Directions:** Read each of the questions below and then read your article. Underline information in the article that will help you answer the questions. Work together as a team so that you don't miss any important fact or detail.

**WHO** might be responsible?

**WHAT** happened to cause the fire, and what did the fire destroy?

**WHERE** might such a fire take place?

**WHEN** could it have happened?

**WHY** was the match or lighter lit in the first place, and how did it cause a harmful fire?

What three elements made up the fire triangle?

Is there a bias in the article? Explain.

Is the writing plain and unemotional or does it sensationalize the story?

Is the vocabulary clear and easy to read?







# The Secret Fire Message



Page 1 of 1



Name \_\_\_\_\_




**Directions:** Examine the secret message below. It is composed of words and pictures called rebus writing. Try to solve the puzzle and decode the secret message. Then, create your own rebus secret message, summarizing what you believe is the most important rule about using matches or lighters. Make sure your rebus pictures are clear and easy to decode.


D + s  + tive  + s happen

W +  kids  - te with 

Playing with  is not an  + id +  - t. It's

a choice U M +  - c. When U  - te

with , U  - ppy + t yourself  - f + d

others in  .

