

LESSON #2: THE FIRE TRIANGLE

GRADES:
3-5

TIME REQUIREMENT:
45-60 minutes

STANDARDS:
**Science Standards for Alaska
and NGSS:**
4-PS3-2, 4-ESS3-1

**Alaska Content and
Performance Standards:**
Geography: C-1, C-2
Arts: A-2
Alaska Cultural Standards:
B-1

OVERVIEW:

In order to burn, fires need the available parts of the fire triangle—*fuel*, *oxygen*, and *heat*. This lesson highlights each of the three parts.

BACKGROUND INFORMATION:

Fire is a rapid chemical reaction that combines fuel and oxygen to produce heat and light. Fire experts use the fire triangle as a way to focus on each of the three components needed for a fire. To stop, start, or slow down a fire, one of the three components of the triangle must be changed. Heat is sometimes referred to as *ignition*; it is the rapid transfer of energy that starts the chemical reaction. In interior Alaska the heat energy usually comes from lightning or human activity (match for a campfire, sparks from an ATV, cigarettes). In the wild, fuels are readily available as leaves, grass, dead wood, roots, partially decomposed plants, stumps, or brush both above and below the ground. Oxygen is affected by wind, rain, dirt, or anything that increases or decreases its availability. This lesson focuses on each of the three parts of the fire triangle individually, but only when they are together in the right ratio will they become fire.

CONSIDERATIONS:

This lesson uses video demonstrations. If you decide to do these demonstrations yourself, be sure to take safety precautions and discuss them with the students.

MATERIALS NEEDED

- Demonstration videos (Oxygen and Heat/Fuel)
- Sticky notes (and space to post them)
- Illustration of the fire triangle
- Fire Triangle Template sheets

LEARNING OBJECTIVES

The student will:

1. Identify that oxygen, ignition and fuel are all needed to produce and maintain fire
2. Identify heat or ignition sources as points of energy transfer
3. Create a model of the fire triangle

ASSESSMENT

1. Student's answers in class discussion. Do they understand that:
 - All three elements must be present for a fire to occur?
 - The heat is a form of energy being transferred?
2. The observations that students put in each triangle section

ACTIVITY STEPS

1. Opening discussion

Ask students if they have ever seen a wood stove or campfire and have them explain what they have seen and noticed. Draw out the idea that heat and light are forms of energy. Tell the students that you are going to demonstrate specific parts of a fire.



2. Oxygen demonstration

A. Show the "Oxygen" video:

https://www.youtube.com/watch?v=5AOp8Tfvlbo&list=PLk6lIYH-I4WDteQ7YfkF6o_KinT81eQZ2&index=1

- B. Ask the students to think to themselves, "What happened in each case? What was different? What was the same?"
- C. Write the questions on the board and show the video.
- D. Ask the students to pair up and share what they observed in each case. Show the video again if needed.
- E. Lead a short class discussion focusing on observations. Redirect any

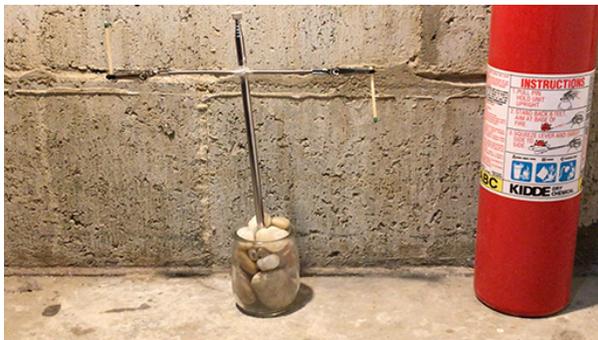
inferences or talk that leads away from observations. At some point wrap up the discussion by stating “So we all noticed that both candles went out. What were the steps leading up to each candle going out?”

- F. Solicit student ideas and help them focus on the fact that the flame stopped burning in each case. Now ask the student pairs to make a claim about why they think the flame went out. Ask each student pair to write their answer on a sticky note.

WRITING PROMPT:

“We think the flames stopped burning because _____.”

- G. Post the sticky notes on a wall and review them as a class. Group similar theories and ideas.



3. Heat demonstration

- A. Show the “Heat/Fuel” video and pause at the prompt at 0:12: <https://www.youtube.com/watch?v=GheKNRajRJo&t=18s>

- B. Ask the students if the matches are burning (“Is there is a flame?”). Have them pair-share to explain why the matches are not burning and what is needed for the matches to burn (“What’s missing? What needs to happen?”). Each team writes their answers on a sticky note.

WRITING PROMPT:

“We think that the matches are not burning because _____. “_____ needs to happen for the matches to burn.”

- C. Post the sticky notes on a wall and review them as a class. Group similar theories and ideas.

Pedagogy Note: The idea is to begin discussing the idea that some kind of energy must be present, whether it is heat from friction, or the heat from a flame. A good vocabulary word to introduce at this point is ignition.



4. Fuel demonstration

- A. Prepare to resume the video by telling the students that the matches will be

lit. Ask the students to predict what is going to happen by pair-sharing:

Will the matches both burn the same way? Will one match burn more than the other? Why / why not?

B. Resume the video.

C. Ask the students to pair share:

Was there any difference in how the matches burned? If yes, what is the explanation for that difference?

D. Resume the video. It will repeat the demonstration with new matches.

E. Now ask the students to consider:

What happened to the wood of the matches when they burned? Ask each pair of students to write their answer to the prompt on a sticky note.

WRITING PROMPT:

“We think that the wood from matches turned into _____.”

F. Post the sticky notes on a wall and review them as a class. Group similar theories and ideas.

Pedagogy Note: At this point the students should be ready to discuss energy showing up as heat or fire.

5. Fire triangle

A. Review the theories and ideas generated in the three demonstrations / activities.

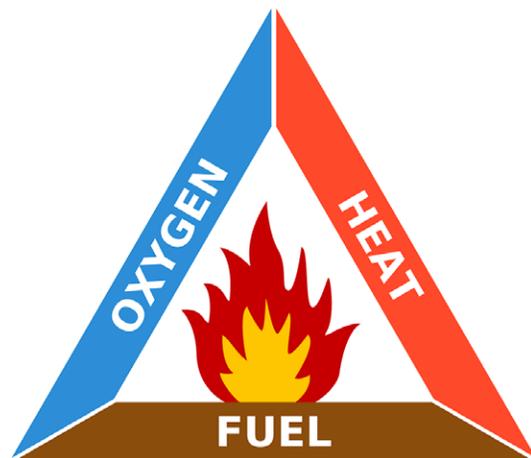
B. Now introduce the fire triangle. Explain that each demonstration focused on one part of the fire triangle and that all three things must be present in order for a fire to be present. Identify each part of the fire triangle in the demonstration and point it out.

Pedagogy Note: Oxygen is always present, so we might talk about some ways that the match could be extinguished (water, sand, blowing) and how these interfere with Oxygen.

6. Describe the Fire Triangle

A. Hand out the template sheets and ask students to label the sides of the triangle according to the diagram.

B. Have them draw or write a description of what they observed for each side of the triangle and then explain why they drew or wrote.



credit: wikimedia | Gustavb

EXTENSION

Divide the students into groups of 3-4. Have them use the attached template and label each side of the triangle with one aspect of the fire triangle. Explain that they are going to apply the fire triangle to different situations.

Model the activity using the Fuel demonstration from the Heat/Fuel video. In the central triangle write “Fuel Demonstration” (or any other name that you used). In the section corresponding to ‘Fuel’, write “The wood/ paper of the matches”. In the section corresponding

to ‘Heat’, write “The friction on the match head” -or- “The heat from the flame”, depending upon how you ignited the matches. In the section corresponding to ‘Oxygen’, write “The air in the room”.

Have the students do the same using different settings. They could also draw the different examples. A series of suggested settings with corresponding examples is below.

Setting	Oxygen	Heat	Fuel
Forest fire	Air in the forest Wind	Lightning Cigarette butt	Trees Leaves
"Oxygen" video demonstration	Air in the room No air in jar	Match used to light candle	Candle wick
Campfire	Air outside Wind Person blowing on fire	Lighter that started campfire	Wood put into the fire
Wood stove	Air outside Draw from chimney and stove door	Match that started fire in stove	Paper Kindling Logs

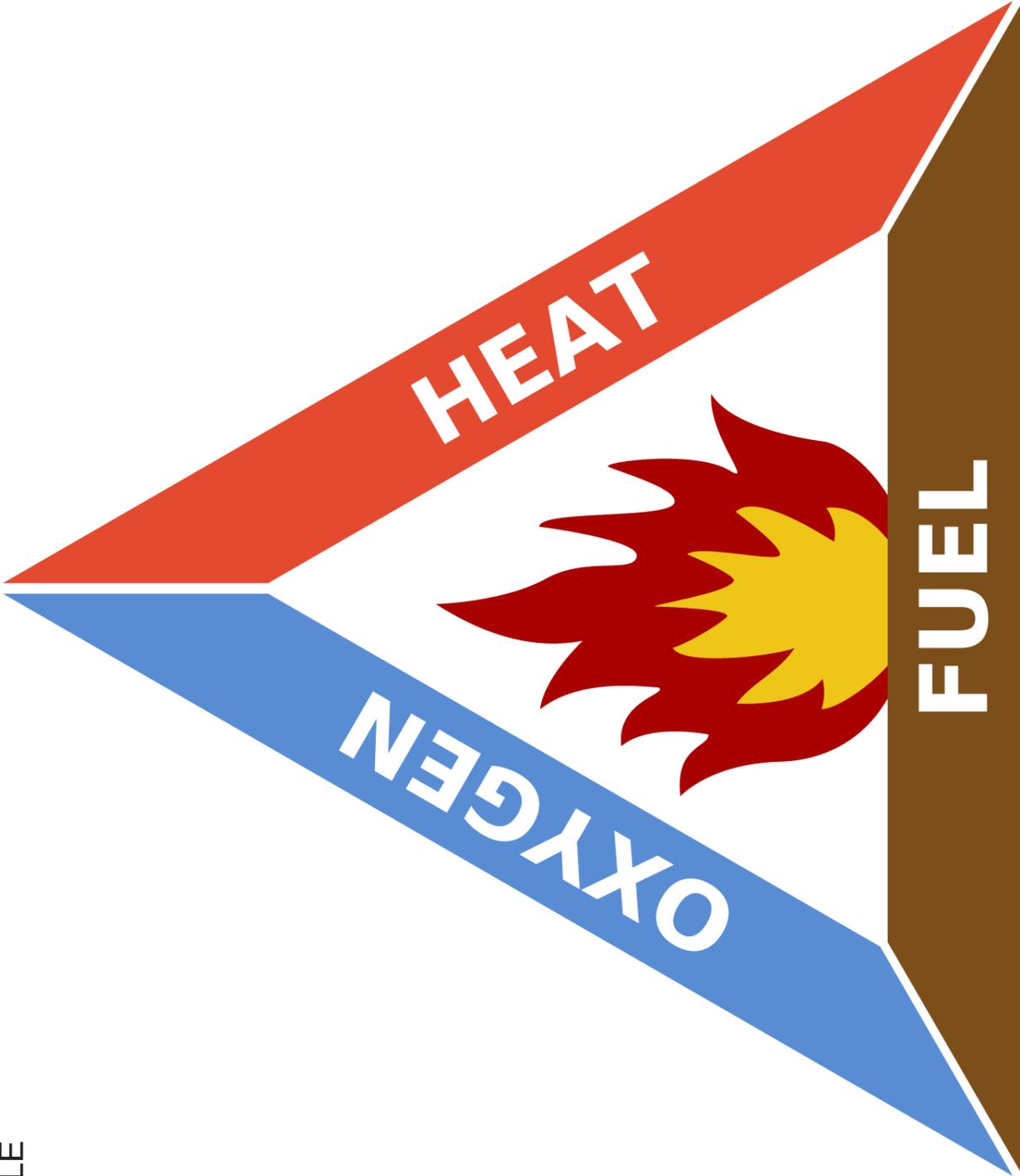
Pedagogy Note: *The emphasis of this exercise is on having the students theorize about the different ways the parts of the Fire triangle show up in day-to-day events. Discussing their responses and having them use observations and evidence to explain their reasoning is more important than whether or not the answer is ‘right.’*



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FIRE TRIANGLE



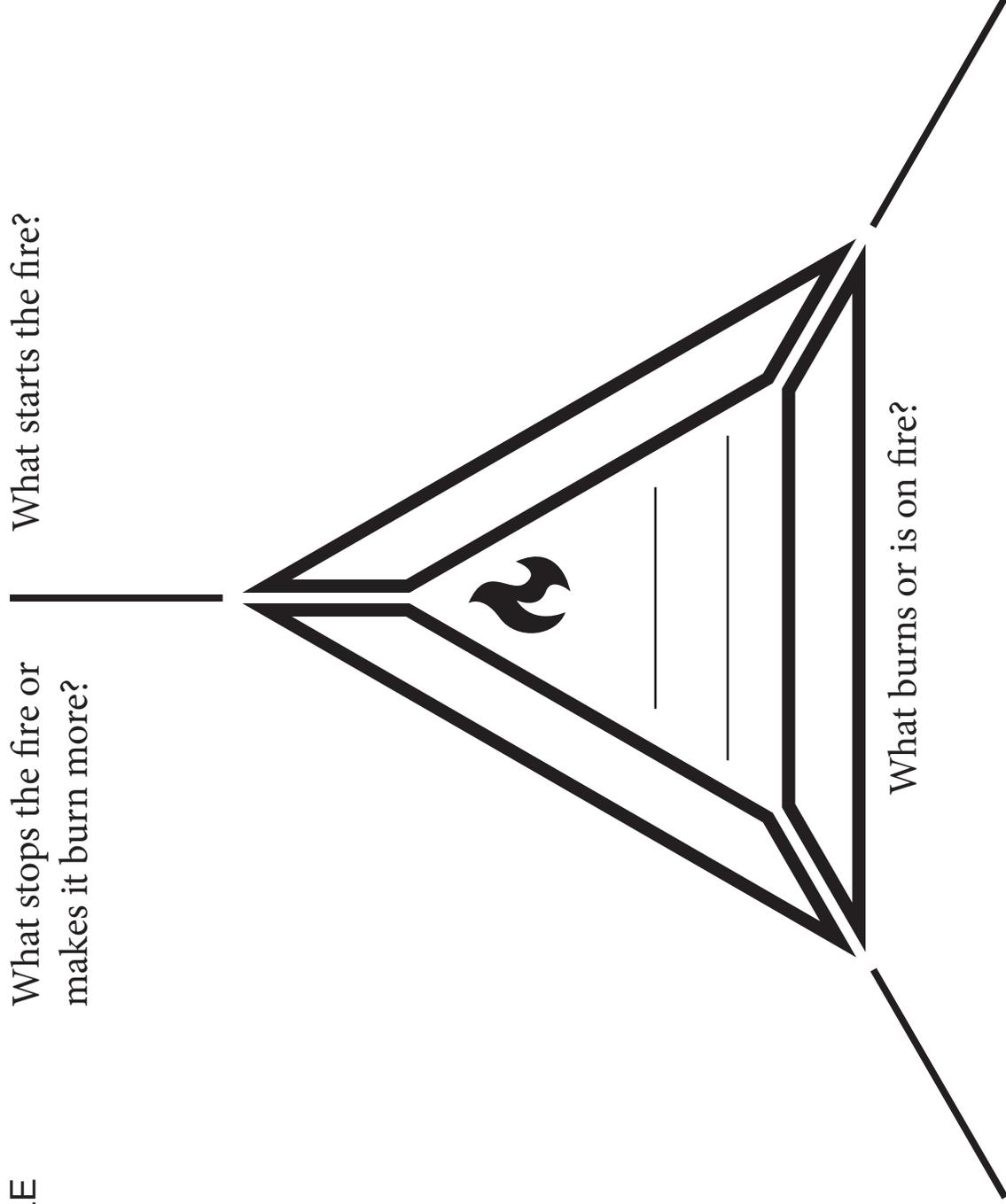
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FIRE TRIANGLE TEMPLATE

What stops the fire or
makes it burn more?

What starts the fire?



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FIRE TRIANGLE EXAMPLES

What stops the fire or
makes it burn more?

What starts the fire?

Air in the
classroom

Friction on the
matchhead



OXYGEN

HEAT

Fuel

Demonstration

FUEL

What burns or is on fire?

The wood of the
matchstick

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