Created – 1/2018

Fire & Life Safety Education

Title: Fire Smoke's impact on the Human Respiratory System

Subject: Grade 4 Lesson Plan

Section: 4-2

Reference: *North Carolina Common Core Standards for Grade 4*, *North Carolina Essential Standards for Grade 4*; *Essentials of Firefighting, 4th edition*; *Fire Life and Safety Education, 3rd edition*; *Emergency Care*;

Learning Environment: Cognitive & Psychomotor

Time: 45 minutes total

Materials: lesson plan, pictures of the respiratory system and smoke and gases in action, activity sheet "how fire products hurt the body/what would happen" and the matching exercise on the respiratory system, coloring books and brochures

North Carolina Common Core State Standards
NCSS W 4.2: Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

NCSS R.4.2: Determine the main idea of a text and explain how it is supported by key details, summarize text.

NCSS R.4.3: Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.

NCSS SL.4.1: Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development and style are appropriate to task, purpose and audience.

NCSS SL.4.1.c: Pose and respond to specific questions to clarify and follow-up on information and make comments that contribute to the discussion and link to the remarks of others.

NCSS SL.4.1.d: Review the key ideas expressed and explain their own ideas and understanding in light of the discussion.

North Carolina Essential Standard for Healthful Living—Personal and Consumer Health (PCH)
4.PCH.2.1: Identify the basic components and functions of the respiratory system

Terminal Objective:

After participating in a five to ten minute presentation, each fourth grade student shall explain the dangers of smoke to the respiratory system by oral and or physical response with 100 percent accuracy.

Enabling Objectives:

1. While participating in five to ten minute presentations, each fourth grade student shall identify the components of the respiratory system and their function by oral response with 100 percent accuracy.

2. While participating in a five to ten minute presentation, each fourth grade student shall review the characteristics of smoke by oral response with 100 percent accuracy.

3. While participating in a five to ten minute presentation, each fourth grade student shall explain the dangers to the respiratory system by oral response with 100 percent accuracy.

Presentation:

Prior to beginning lesson, remember to introduce the team members present and tell the purpose of the visit. In the explanation facilitator will explain what the students will learn and do during the presentations. The students will learn about the effects of smoke on the lungs.

Enabling Objective 1

While participating in a five to ten minute presentation, each fourth grade student shall identify the components of the respiratory system and their function by oral response with 100 percent accuracy.

Content:

Ask—What do you know about the respiratory system?

Show the large picture of the respiratory system. If would be helpful to have enough of the pictures for at least 2 people to share.

Talk about the different parts and their function.

Facilitator Information: Respiratory System

A) Nose or nasal cavity—where air from outside is brought into your lungs. Made up of muscle, bone, cartilage. It has mucus membranes and little hairs that help remove dust, pollen, etc. from the air like a filter and an air purifier. It also warms the air going into the lungs.
B) Mouth—Oral cavity that allows a great amount of air to enter the body. It has No little hairs to filter the air.

C) Pharynx—Your throat. muscle that extends from the respiratory openings to the esophagus and larynx.
D) Larynx—voice box. It is a part of the defense system to keep food from going into the trachea. A little piece of cartilage is called the epiglottis and looks like a flap which closes as you swallow food or liquid. If it does not close fast enough the larynx will produce a cough reflex.
E) Trachea or windpipe—A tube made of cartilage rings about 5 inches long. Provides a clear path for air to enter and exit the lungs.
F) lungs—There are 2 of them and they work together. Inside they look like sponges.
G) Bronchi—goes into your lungs; one on the left, one on the right. Carries air from the trachea to the lungs. They are made of smooth muscles that help to regulate airflow. In the lining there are little hairs that help trap dust, etc. from going into the lungs. The Bronchioles also have these hairs
H) Bronchioles—at the end of each bronchi. They are like Tiny little hairs.
I) Alveoli—bunches of sacs full of air. Allows for the exchange of oxygen and co2 to take place in the lungs
J) Capillaries—at the end of alveoli.
K) rib cage—goes around your heart and lungs for protection
L) Diaphragm is below your lungs. It is a large muscle that works with your lungs to get air in and out. When the diaphragm contracts it helps to pull air in and more space is provided for lungs to expand. The intercostal muscles contract, the rib cage move up and air is forced into the lungs. It relaxes and allows air to flow back out of the lungs when you exhale.

You can feel them working together. Put one hand on your chest and one hand on your upper tummy. Take a deep breath. You will feel your chest and tummy get bigger as air goes into your lungs. Feel your diaphragm get tighter.

When you inhale the air goes in through your mouth and nose. Little hairs called cilia collect the dust that you might breathe in. There are also more cilia in your trachea to stop the dust from getting into your lungs.

Your diaphragm flattens out and your ribcage lifts and air goes through the bronchi and bronchioles and fills the alveoli.

Oxygen goes through the walls of the alveoli and into the capillaries where the oxygen enters the red blood cells in each blood vessel.

The blood carries the oxygen to the heart which pumps al of the oxygen-carrying blood to every cell in the body.

As each red blood cell empties its load of oxygen, it picks up carbon dioxide from the cells and heads back to the lungs. It is carried by the red blood cells in the lungs capillaries to the alveoli where it is emptied into the air that leaves the body when you breathe out.

Application: Have students to complete a matching activity, matching the part of the respiratory system to its description.

Enabling Objective #2

While participating in five to ten minute presentations, each fourth grade student shall identify the characteristics of smoke by oral response with 100 percent accuracy.

Content

1. Review with the students the fire triangle and how these components coming together can start a fire.

2. Review fire—Show pictures of fires. (rapid chemical reaction that occurs when a fuel is ignited and combined with oxygen to give off light, heat and smoke).

3. Review with the students the characteristics of smoke.

Facilitator information

Smoke is a by-product of fire containing airborne solid and liquid particulates and gases.

Smoke rises
Smoke is dangerous. It contains particles that make it dirty and blocks vision, irritates the eyes and lungs. It is also gives off poisonous gases that are harmful to your lungs and body.
Smoke is Dark and Dirty. You are easily disoriented especially if you are awakened in the middle of the night. Smoke is so dark that you cannot see and have difficulty going from place to place.
Smoke is Hot.

Enabling Objective #3

While participating in a five to ten minute presentation, each fourth grade student shall explain the dangers to the respiratory system by oral response with 100 percent accuracy.

Content

Ask--Do we want to breathe that? That is correct no we do not. **Why?** because of the toxic stuff in the smoke and what it can do to your lungs. Tell them—Most deaths that occur in fires are from smoke inhalation and not burns. **What do you supposed it is made of?**

Show the smoke and gases picture.

Facilitator Information

When we inhale air, oxygen goes through our lungs and then into our bodies. If we breathe in hot smoke it will damage your respiratory system. It can burn the mouth and Nose causing irritation and swelling.

Heat from smoke can cause burns on the skin. The heat from smoke can burn the trachea, bronchi and tiny bronchioles in your lungs. This causes irritation to the respiratory tract and swelling. When swelling occurs the airway can collapse or close up causing respiratory distress.

It can also raise body temperature to dangerous levels.

Smoke can irritate your eyes and block vision.

Some of the Chemicals such as carbon monoxide will keep the blood from carrying oxygen. Carbon monoxide is tasteless and odorless but is toxic. It can make you sick and even kill you.

Other chemicals such as Hydrogen cyanide prevent cells from using oxygen. If cells do not get the oxygen or cannot use oxygen it gets, they will die.

There are even other chemicals such as carbon dioxide that displaces oxygen so that there is not enough oxygen to breathe. The body is deprived of its source of oxygen.

That's why firefighters wear special equipment call a SCBA when they go into a fire to keep them from breathing the poisons and heat in the smoke.

Do we want to breathe all that?

Talk about the signs and symptoms of the toxic effects of smoke inhalation. Cough, red eyes, cherry red skin, shortness of breath, hoarseness or noisy breathing caused by fluids in upper respiratory tract or swelling of the airway blocking air intake, soot around mouth and nose, headache, changes in mental status such as confusion, fainting, seizures, coma, death.

What do we have in our homes that can help us to prevent harm to our respiratory system? (smoke alarms, don't play with matches and lighters, don't leave food cooking unattended on stove) Let them answer.

Application

Have the students complete the activity sheet "How fire products hurt the body/what would happen"

Talk about the parts of the SCBA in relation to the lesson and how it functions for the firefighter fighting fire.

Closure:

Review and take questions. Tell the students that this lesson gives them the reasons why fire and smoke is dangerous and deadly. They should remember not to play with lighters and matches and fire. They should be alert to smoke alarms and respond quickly.

Have them write down 3 things they learned today about the respiratory system, 2 things they learned today about the effects of smoke on the respiratory system, 1 way they can prevent a fire and smoke inhalation.

Challenge them to write a letter to their parents about what they learned today. Share the how they can prevent fires and the harmful effects to their lungs.

Leave the coloring books and the brochures with the teacher.

Lesson contributed by Carolyn Townsend, FLSE with Pleasant Garden Fire Department