

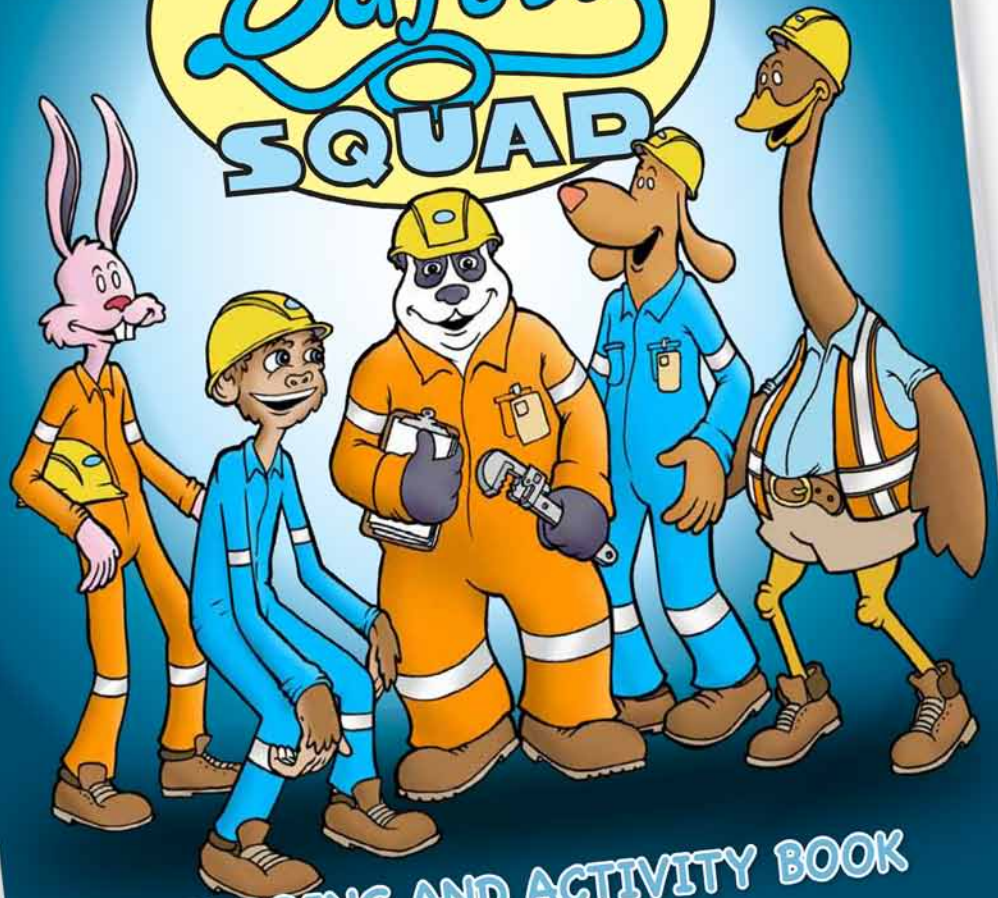


The Educator's Guide to:

Learning About Natural Gas with the Safety Squad

LEARNING ABOUT NATURAL GAS

with
THE
Safety
SQUAD



COLORING AND ACTIVITY BOOK

Inside

- Essential questions for student inquiry
- Ready-to-use lessons to engage and explore
- Activities to extend learning
- Standards correlation
- Glossary of useful terms

Introduction

Many of us use natural gas in our homes for heating and cooking every day. Without this resource, life would be very different! This guide, a supplement to the kids' book *Learning about Natural Gas with the Safety Squad*, provides educators and parents with essential background information, practical lessons, and hands-on investigations for educating children about natural gas use and safety. Large group activities ideal for the classroom and small group activities suitable for the home are designed to enhance student learning. Essential questions and lesson plans are linked to curriculum requirements and explore themes within topics such as science as inquiry, physical science, science and technology, and science in personal and social perspectives. The guide's activities aim to help children acquire skills that are significant in their developmental process—to collect, organize, and communicate ideas.

Essential Questions

What is natural gas?

Natural gas is colorless and odorless (that's right, this means we can't see it or smell it!), and is composed primarily of a gas called methane. **Natural gas**, **coal**, and **oil** are called fossil fuels because they are created from ancient living organisms.

Where does natural gas come from?

As plants and animals die in humid and swampy areas, they are covered with sediment, water, and more decaying materials. After many millions of years of heat and pressure, these organic remains are transformed into coal, oil, and natural gas. Natural gas is located in pockets deep within the earth. We can extract the gas by drilling wells and piping it up to the surface.

How does natural gas get to our homes, schools, and businesses?

Natural gas travels long distances through underground pipes, or gas mains, to the homes, schools, and businesses that need it. Buildings that use natural gas for heating or cooking also have a gas meter. Just like an electric meter, the gas meter measures how much gas we use each month.

What do we use natural gas for?

Natural gas is used for cooking in many homes. It is used to start and maintain a flame that makes the stove and oven work so we can cook or bake our food. It's also used to heat many homes. Can you guess what a water heater does? That's right! It heats the water that comes out of the tap. Gas water heaters use natural gas to heat up the water inside the tank, so we have warm water to wash our hands, to take a shower or bath, and to wash dirty dishes or clothes.

Is natural gas dangerous?

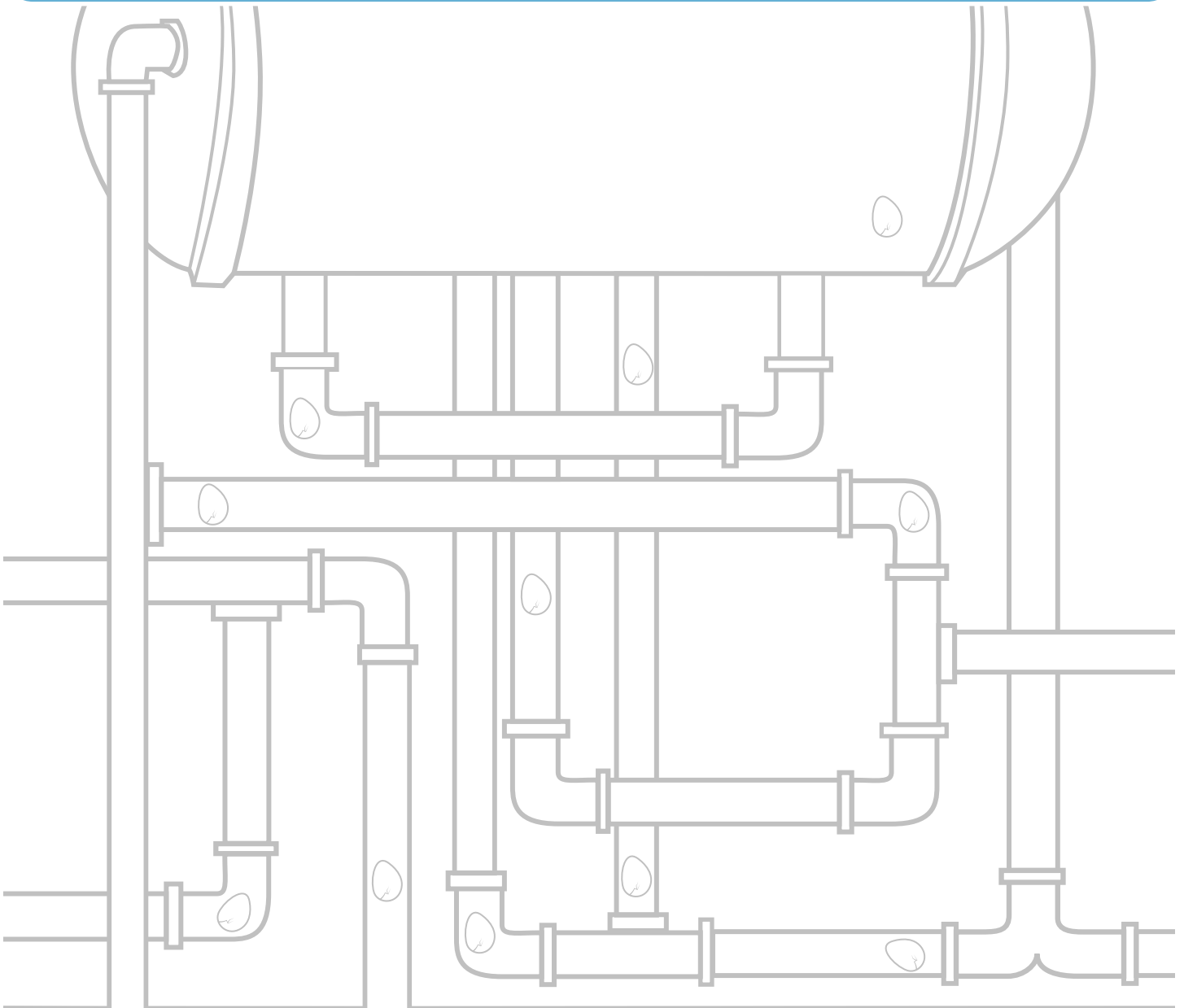
Natural gas is very safe when it's contained in pipes within your home. It's only dangerous when there is a gas leak. You can tell if there is a gas leak by using your nose. Gas companies add a rotten egg smell to the natural gas so you can smell it if it's leaking out of a pipe. If you think you smell a gas leak, tell an adult! And if you smell gas, don't use any electronics—they could cause a spark! Everyone should leave the house or building right away!

What is carbon monoxide?

Carbon monoxide is a gas that you cannot smell or see, and it is very dangerous to breathe in. But don't worry—it's easy to stay safe from carbon monoxide. Just make sure your family has a working carbon monoxide detector. Carbon monoxide detectors are similar to smoke detectors and can detect the harmful gas. If the alarm goes off, exit the house right away!

What can you do to stay safe around natural gas?

- If you smell a strong odor like rotten eggs, don't use anything that could cause a spark, and leave the house right away!
- Don't climb pipes in your basement. They could be filled with gas.
- Outside pipes can contain gas, too, so it's best not to touch those either.
- Don't jump on pipes or the gas meter! Play on something safe, like monkey bars, instead.
- If you see flags in the yard, don't move them! They may be marking where the gas pipes are located under the dirt.
- Don't use your oven or stove to warm up. Ask an adult to turn up the heat, or put on a sweater.
- Don't pile anything around an **appliance** that burns fuel. Appliances need oxygen to work, just like people need oxygen to breathe!
- Paint, boxes, and chemicals are fire hazards. Remember not to store them near an appliance.
- Every house should have a **fire extinguisher**. Ask an adult where to find it in your house.
- Install a carbon monoxide detector.



Lessons to Engage and Explore!

I. Natural Gas Formation

Introduction

Natural gas is naturally formed over millions of years from the decomposition of dead plants and animals that lived in humid and swampy areas. As the plants and animals are covered with sediment, soil, and water, the decaying material undergoes added heat and pressure, and the remains are transformed into coal, oil, and natural gas. The energy we use every day comes from these fossil fuel sources.

Objectives and Learning Goals

Students will realize that natural gas is formed from the decomposition of organic material such as dead plants.

Time and Groups

One 45-minute session and one follow-up 30-minute session; groups of 4-5 students

Materials

Plastic bottles, soil, raw vegetable scraps, balloons, funnel, and duct tape

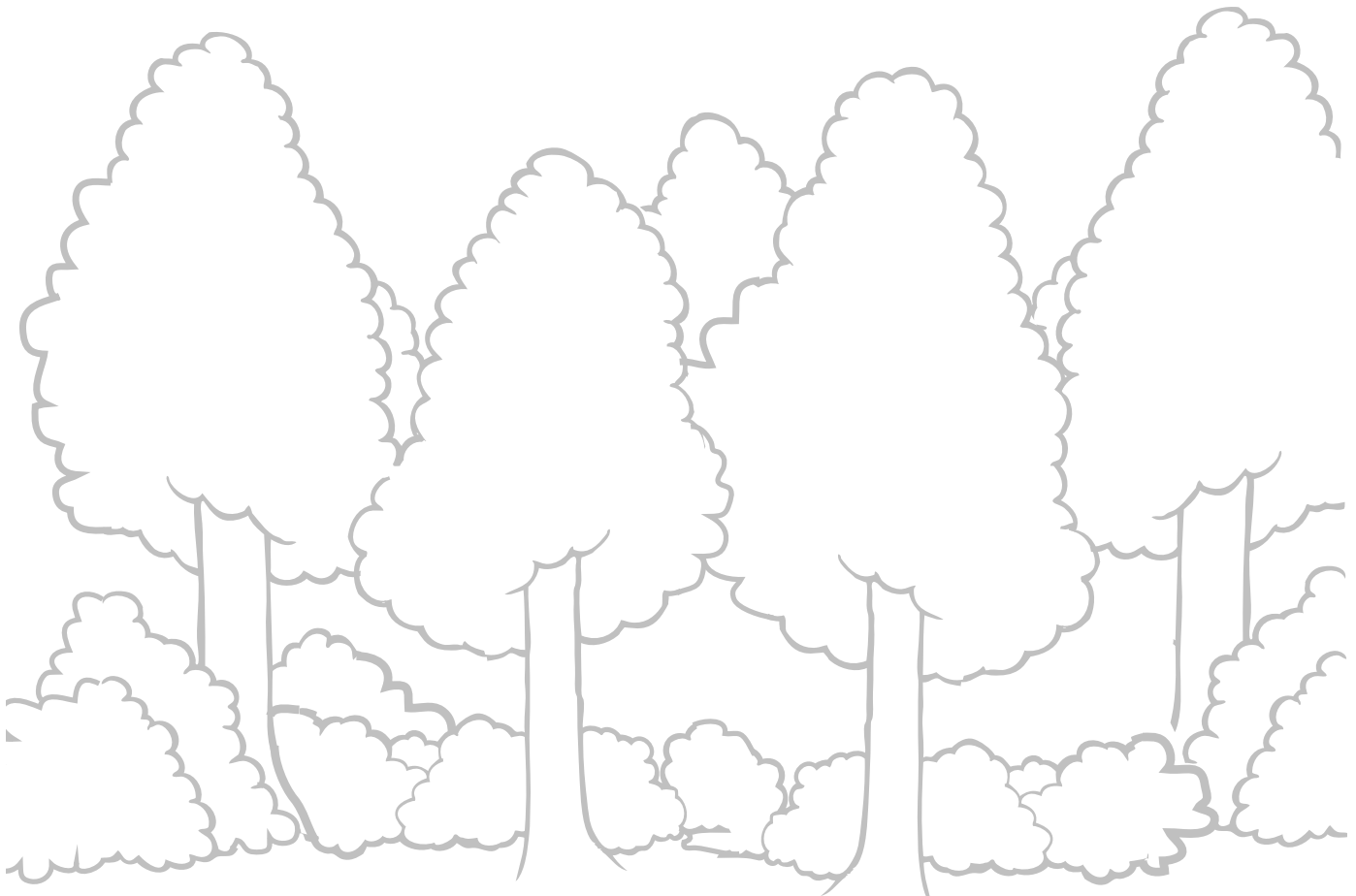
Activity Procedure

- ▶ Give each group a plastic bottle, some soil, vegetable scraps, water, a balloon, and duct tape.
- ▶ Ask students to mix together some soil, raw vegetable scraps, and a small amount of warm water, then pour the mixture into their plastic bottle using a funnel.
- ▶ Place a balloon around the mouth of the bottle and secure it using duct tape. Make sure there are no holes for air to escape!
- ▶ Leave the plastic bottles in a warm place where they won't be disturbed. As the vegetable scraps break down, they will release gas!
- ▶ After one week, observe the mixture in the bottles and the effect on the balloons. Remember that this process takes time, so be patient!

Follow-Up Questions

Why did the balloon grow?

How does this experiment relate to natural gas formation in nature?



2. Natural Gas Distribution System—Make a map!

Introduction

Natural gas may travel a long way from the processing plant through underground pipes or gas mains to the homes, schools, and businesses that need it. In this activity, you will learn about each step in the distribution process. Then you will create a step-by-step map from the well all the way to your appliance!

The Journey of Natural Gas!

1. **Well:** A very deep hole made to extract or remove the natural gas from the earth.
2. **Processing plant:** A large building where natural gas is treated and cleaned.
3. **Transmission pipes:** Large pipes that transport the natural gas from the processing plant.
4. **Compressor station:** These facilities are located along the transmission pipes and compress or squeeze the gas so it continues to flow quickly through the pipes.
5. **Storage tank:** Some natural gas is stored in large tanks for later use.
6. **Utility:** Natural gas is delivered to a local utility company so it can be distributed.
7. **Distribution mains:** Smaller underground pipes that carry natural gas from a utility to homes, schools, and businesses.
8. **Service line:** Another pipe that carries the natural gas from the distribution main to the **gas meter**.
9. **Gas meter:** A device located on a home or building that measures the amount of natural gas used.
10. **Gas line:** A smaller pipe that carries the natural gas to home appliances like the stove.
11. **Appliance:** A home device such as an oven or water heater that uses natural gas to work.

Objectives and Learning Goals

Students will understand how natural gas travels to homes, schools, and businesses.

Time and Groups

45 minutes; small groups of 2–3 students

Materials

Poster paper, markers, colored pencils, and/or crayons

Activity Procedure

Before starting the activity, talk with the whole class about each step that natural gas goes through in its journey to their homes. Write the name of each step and a short definition beside it to guide the students in their map making.

- Ask the students to use the information provided to map out (step-by-step) the journey natural gas takes from the well to their home appliances. Remind them to draw and label each of the eleven steps.



3. Spreading Natural Gas Safety Awareness!

Introduction

Now that you know how to be safe around natural gas, spread the word!

Objective and Learning Goals

Students will learn to communicate natural gas safety ideas to their school community.

Time and Groups

45–60 minutes; small groups of 2–3 students

Materials

Poster paper and colored pencils or markers

Activity Procedure

- Divide students into small groups.
- Ask students to create posters to hang up around the school to spread their natural gas safety ideas.

At Home Activities to Extend Learning!

1. Natural Gas at Home

Overview

Families use natural gas in many ways at home. How does your family use natural gas?

Exploration

With an adult helper, list (or draw) how you use natural gas around the house.

Extension

Be a natural gas saver detective! How can you save energy in your home? How can you use less natural gas?

2. Meter Reader

Overview

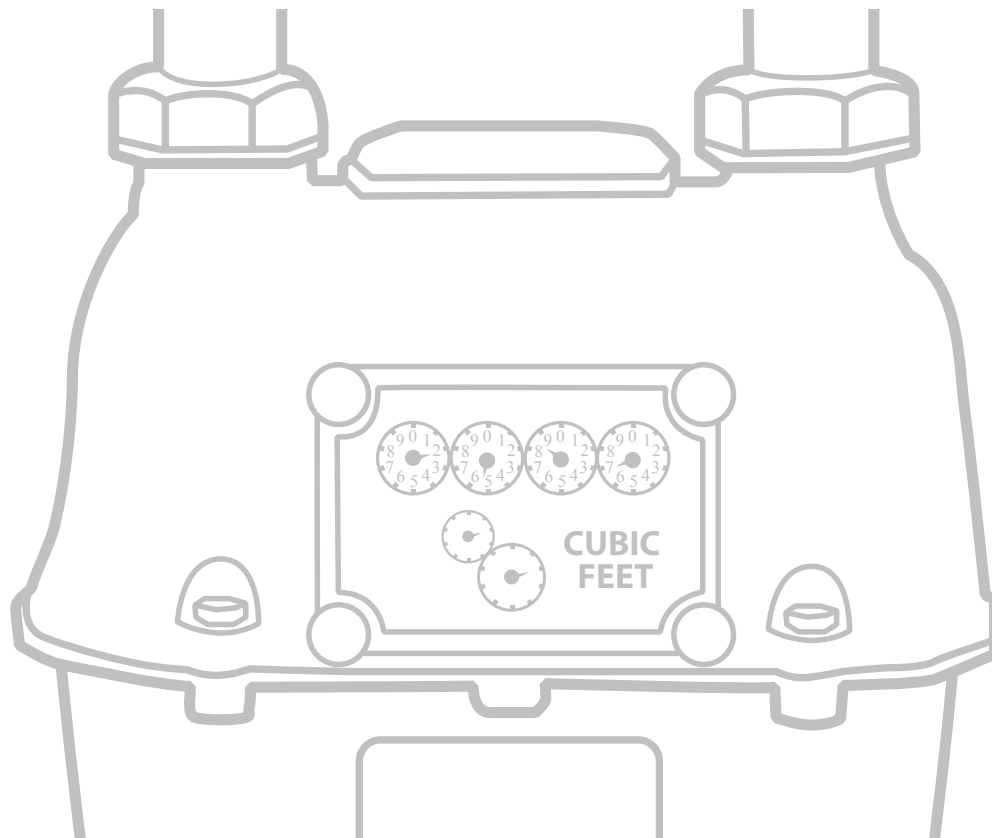
Homes that use natural gas for heating or cooking have a gas meter. Just like an electric meter, the gas meter measures how much gas your family uses each month. A gas meter can look complicated, but once you learn about the different parts, you will be able to read your home's meter and help your family keep track of their energy usage.

Exploration

Can you read your home gas meter? Make sure to ask an adult for help!

Extension

Keep track of your gas usage each month. In what month does your family use the most? The least?



3. Safety at Home

Overview

Natural gas is very safe when it's contained in pipes within your home. It's only dangerous when there is a gas leak. You can tell if there is a gas leak by using your nose. Gas companies add a rotten egg smell to the natural gas so you can smell it if it's leaking out of a pipe. If you think you smell a gas leak, tell an adult! You shouldn't use any electronics, because they could cause a spark, and everyone should leave the house or building right away!

Exploration

Make a natural gas safety list for your home. Include safety tips and emergency phone numbers. You can put the list on the fridge so all of your family members know what to do in an emergency.

Extension

Hold a family meeting and make sure everyone in your house knows what to do!



Glossary of Useful Terms

Carbon monoxide A poisonous gas that you can't see or smell.

Appliance A home device such as an oven, refrigerator, or washing machine.

Coal A blackish rock that forms over millions of years from organic materials; it is extracted from the earth and used to make a large portion of the electricity we use every day.

Fire Extinguisher A device that can be used to put out fires.

Gas meter An instrument used in homes and businesses to measure the amount of natural gas used.

Oil A dark-colored liquid used to make fuels such as gasoline, jet fuel, diesel fuel. It's most commonly formed over millions of years from organic material that lived in marine environments.

Natural Gas A gas used in many homes for heating and cooking. Natural gas is also a product of millions of years of plant and animal decay; it is extracted from pockets deep within the earth.

Correlation to Standards

This educator's guide can be correlated to the standards listed below for students in grades K–5. The activities provided in this guide allow children to use appropriate techniques to collect, organize, communicate, and visualize data. Selected lessons also enable the use of mathematics to ask questions and form conclusions.

National Science Education Standards K-4

Content Standard A: Science as Inquiry, A1. Abilities necessary to do scientific inquiry, A2. Understanding about scientific inquiry

Content Standard B: Physical Science, B1. Properties of objects and materials

Content Standard D: Earth and Space Science, D1. Properties of Earth materials

Content Standard F: Science in Personal and Social Perspectives, F5. Science and technology in local challenges

Next Generation Science Standards

Scientific and Engineering Practices: Asking questions and defining problems; Planning and carrying out investigations; Analyzing and interpreting data; Obtaining, evaluating, and communicating information

Disciplinary Core Ideas: PS1 Matter and Its Interactions; PS3 Energy; ESS3 Earth and Human Activity

Crosscutting Concepts: Energy and Matter, Stability and change

Common Core Standards

English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects K-5

Reading: Informational Text

Key Ideas and Details: CCSS.ELA-LITERACY.RI.K.1, 1.1, 1.2, 1.3, 1.4, 1.5; CCSS.ELA-LITERACY.RI.K.2, 1.2, 2.2, 3.2, 4.2, 5.2
Craft and Structure: CCSS.ELA-LITERACY.RI.K.4, 1.4, 2.4, 3.4, 4.4, 5.4

Integration of Knowledge and Ideas: CCSS.ELA-LITERACY.RI.K.8, 1.8, 2.8, 3.8, 4.8, 5.8

Range of Reading and Level of Text Complexity: CCSS.ELA-LITERACY.RI.K.10, 1.10, 2.10, 3.10, 4.10, 5.10

Writing

Text Types and Purposes: CCSS.ELA-LITERACY.W.K.1, 1.1, 2.1, 3.1. 3.1.A, 3.1.B, 4.1, 4.1.A, 4.1.B, 5.1, 5.1.A, 5.1.B

Production and Distribution of Writing: CCSS.ELA-LITERACY.W.K.5, 1.5, 2.5, 3.5, 4.5, 5.5

Research to Build and Present Knowledge: CCSS.ELA-LITERACY.W.K.8, 1.8, 2.8, 3.8, 4.8, 5.8

Speaking & Listening

Comprehension and Collaboration: CCSS.ELA-LITERACY.SL.K.1, K.1.A, K.2.B, 1.1, 1.1.A, 1.1.B, 1.1.C, 2.1, 2.1.A, 2.1.B, 2.1.C, 3.1, 3.1.A, 3.1.B, 3.1.C, 3.1.D, 4.1, 4.1.A, 4.1.B, 4.1.C, 4.1.D, 5.1, 5.1.A, 5.1.B, 5.1.C, 5.1.D

Presentation of Knowledge and Ideas: CCSS.ELA-LITERACY.SL.K.5, 1.5, 2.5, 3.5, 4.5, 5.5

Language

Vocabulary Acquisition and Use: CCSS.ELA-LITERACY.L.K.4, 1.4, 2.4, 3.4, 4.4, 5.4

Mathematics Standards K-5

Counting & Cardinality: CCSS.MATH.CONTENT.K.CC.B.4, B.4.A, B.4.B, B.4.C; CCSS.MATH.CONTENT.K.CC.C.6

Operations & Algebraic Thinking: CCSS.MATH.CONTENT.K.OA.A.1, 1.OA.A1, 2.OA.A1, 3.OA.A1, 4.OA.A1, 5.OA.A1

Measurement & Data: CCSS.MATH.CONTENT.K.MD.B.3; CCSS.MATH.CONTENT.1.MD.C.4

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