

# Integrating Literacy and Science Practice Skills via Investigating the Effect of “Cold” (low thermal energy) Phenomenon in *Dr. Rosie Helps the Animals* (K,1,2)

## Teacher Lesson Plan

### Lesson Summary

This two-day lesson is based on the book *Dr. Rosie Helps the Animals*. The first day consists of reading and processing the story, focusing on the various remedies Rosie uses. On the second day, students employ science practice skills while investigating the effect of cold phenomena. This experience gives students a foundational understanding of the particle motion theory.

#### Day 1: Literacy Skills (Common Core)

**Kindergarten:** CCSS.ELA-Literacy.SLK.1 Participate in collaborative conversations with diverse partners about *kindergarten topics and texts* with peers and adults in small and larger groups.

**Grade 1:** CCSS.ELA-Literacy.SL.1.1 Participate in collaborative conversations with diverse partners about *grade 1 topics and texts* with peers and adults in small and larger groups.

**Grade 2:** CCSS.ELA-Literacy.SL.2.1 Participate in collaborative conversations with diverse partners about *grade 2 topics and texts* with peers and adults in small and larger groups.

**Grades 1– 2** R.1.1.1. Ask and answer questions about key details in a text. (1-LS1-2), (1-LS3-1)

#### Day 1: Cultural and Linguistic Practices

Note: *Dr. Rosie's* story provides several examples of natural remedies. This provides an authentic opportunity for students to share remedies they have learned about or experienced from their culture.

From: [Cultural and Linguistic Practices](#)

- ★ Connect the book's content to your students' cultural and linguistic backgrounds.
- ★ Ask students to connect to the remedies in the story by relating them to their cultural experiences.
- ★ Ask relevant and inclusive questions that connect to all students from various backgrounds

#### Day 2: Standards-Aligned Science Practice Skills

##### Kindergarten

##### Analyzing and Interpreting Data

Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations. Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (K-LS1-1)

### **First Grade**

#### **Constructing Explanations and Designing Solutions**

Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.

### **Second Grade**

#### **Developing and Using Models**

Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions.

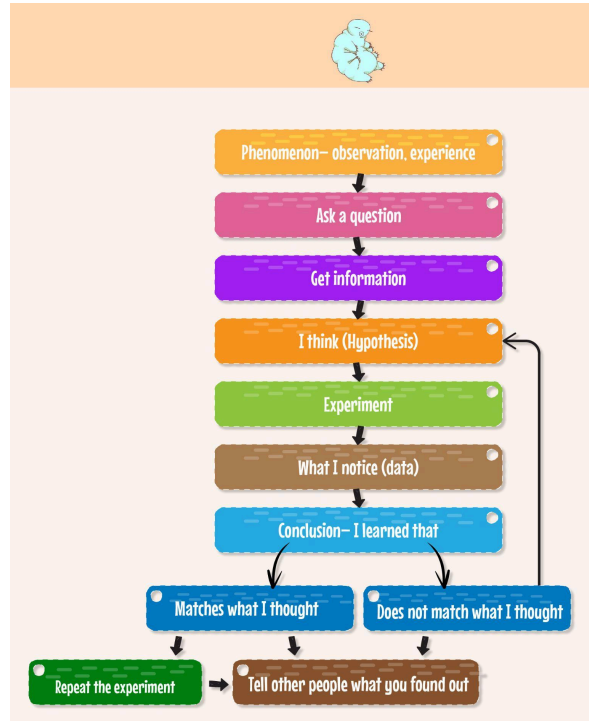
- Develop a simple model based on evidence to represent a proposed object or tool. (2-LS2-2)

#### **Planning and Carrying Out Investigations**

Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.

- Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question. (2-LS2-1)

Phenomenon-based learning is included in the Next Generation Science Standards (NGSS)



### Day 1: Read and Process

Grade Levels: K-2

Topic: *Dr. Rosie Helps the Animals* (Read and process)

**Materials**

- *Dr. Rosie Helps the Animals* Book or [Reading by Rozillia](#)
- Remedies Phenomena Pupil Page-cold

**Lesson Objectives/Learning Goals:**

- ★ Students will be introduced to veterinary medicine as a STEM profession through an engaging informational fiction story
- ★ Students will be able to identify the remedies Rosie used for each affliction.
- ★ Students will be able to compare and contrast Rosie's remedies with their own experiences.

Time	Activity	Teacher Actions	Student Actions
_____ minutes	Introduction to the <i>Dr. Rosie</i> story	<b>Questions:</b> <i>Have you ever been sick? What helped you get better?</i>	Reply to the questions

		Today, you're going to meet a young person who helps animals get better! Listen to find out who Dr. Rosie meets and how she helps each animal.	
_____ minutes	Story Reading and Scaffolded note taking	Give each student a copy of Remedies Phenomena Pupil Page. As you read the story, pause with each remedy. Ask kids if they have had that affliction and what remedies have they used at home. Ask students to match the affliction and remedy on the pupil page.	Listen to the story and match the animal with the remedy

**Day 2: The effect of "cold" (low heat)  
phenomenon-based guided-inquiry science lesson**

<b>Grades levels:</b> K-2	<b>Topic:</b> Effect of Cold Phenomenon	<b>Materials:</b> <ul style="list-style-type: none"> <li>● (per group or as a demo) a specific volume of water in a cup (30 mL), balloon, 3 straws of the same length but with different widths, extra, empty cup</li> <li>● Effect of cold phenomena pupil page</li> </ul>
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**Lesson Objectives/Learning Goals**

- Students will utilize a variety of science practices to model the effect of cold on the blood vessels in the body
- Students will make connections between how easily water flows through straws with different widths and how a compress filled with ice affects a swollen bump\*

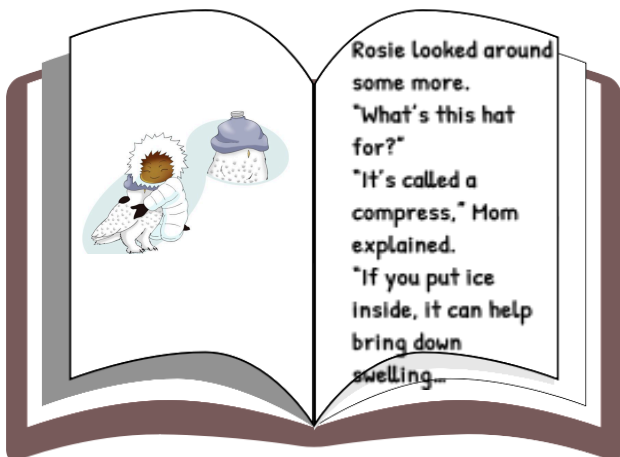
\* It is important to let kids know that when ice reduces swelling, it is due to a physiological response to cold. Ice causes blood vessels to constrict or become more narrow (vasoconstriction). When this happens, less blood and the fluid it brings reaches the injured area. This reduces swelling.

### Science Content Background for this Lesson

In the body, heat causes the parasympathetic nervous system to stimulate M3 receptors in blood vessels, causing the blood vessels to widen (vasodilation). Cold causes the sympathetic nervous system to release norepinephrine, which binds to receptors on the smooth muscle cells, causing the blood vessels to narrow (vasoconstriction)

*In this investigation, students will test the effect of different diameters of straws on the time it takes for water to flow through them. This is a model of how vasodilation and vasoconstriction work.*

### Excerpt from Dr. Rosie Helps the Animals



Vocabulary	
●	
●	<b>Swelling</b> - being puffy. When something is swollen it is bigger than usual.
●	<b>Compress</b> - something that can hold hot water or ice. It is used to help treat pain or swelling.
●	

Rosie's mom claims that ice can reduce swelling. This is a guided inquiry lesson to test the effect of different diameters of straws on the time it takes for water to flow through them. It is also a model of the effect of cold on blood vessels, which results in reduced swelling.

**Before Starting (possible teacher questions)**

1. What did Rosie's mom say that ice would do to swelling?
2. How do you think cold helps bring down swelling? Accept all responses.

**Experiment:**

The effect of "cold" on the size of blood vessels

**Materials for the Experiment:**

- 3 straws of different diameters but the same length
- water (30 mL)
- Empty cup
- balloon
- Effect of cold pupil page

**Directions:**

1. Distribute Effect of Cold Pupil Page- have students complete steps up to and including the hypothesis
2. Distribute the materials.

<b>Material</b>	<b>Model for</b>
Balloon	Skin that has been injured
Wide, medium, and narrow straws	Dilated, regular, and constricted blood vessels (tubes)
Water	Fluid that moves into bump causing swelling

## Water Through a Straw Challenge

**Directions:** Put one end of the straw in the top of the balloon. Secure the balloon around the straw so no water gets into the balloon unless it goes through the straw. Time how long it takes to pour 30mL of water into the balloon through the straw.

**Rule:** Only the water that gets into the balloon through the straw counts. Water that does not go through the straw must be gathered and put back into the cylinder to be poured only through the straw..

### Making Connections:

1. Remember: Rosie's mom said that ice can bring down swelling.
2. Remember:  
the balloon is supposed to be a bump  
The straws are supposed to be blood tubes  
the water is supposed to be liquid in your body that comes through blood tubes to the bump to make it swell up
3. Which straw made it hard for water to move through it and get into the balloon?  
Narrow    Regular    Wide
4. Which straw made it easy for water to move through it?  
Narrow    Regular    Wide
5. What do you think cold does to blood tubes? Support your claim.  
Make them narrower    Make them wider

### Extension

**To the teacher:** *Modeling can be challenging for younger students who tend to think concretely. A teacher (or students) must always point out the model's weaknesses to avoid misconceptions.*



To help students visualize the effect of hot and cold on substances, you can do the following visual model as a demo, or, depending on the age of your students, they can set the experiment up themselves or in groups. You can then point out how the effect of hot and cold on air is similar to the effect of hot and cold on blood vessels; cold makes things contract, and heat makes them expand. With the air and the bottle, heat makes THE PARTICLES of air and bottle particles get farther apart. This is called the particle motion theory. In the body, heat causes the

parasympathetic nervous system to stimulate M3 receptors in blood vessels, causing the blood vessels to widen (vasodilation). Cold causes the sympathetic nervous system to release norepinephrine, which binds to receptors on the smooth muscle cells, causing the blood vessels to narrow (vasoconstriction).

## Materials

- Balloon
- empty glass bottle
- hot water
- ice water

**Balloons, Bottles, and Straws— modeling the effect of hot/cold compresses**



**The balloon expands when the bottle is placed in hot water. The air particles in the balloon and bottle gain energy and get farther apart.**

**The balloon contracts when the bottle is placed in ice water. The air particles in the balloon and bottle lose energy and get closer together.**

Straws with different diameters can be models of blood vessels

**A cold compress causes blood vessels to narrow, reducing blood flow to an area (reduces swelling).**

**A hot compress causes blood vessels to widen, bringing more blood and fluid to an area.**

This is an imperfect model but does help students visualize the effects of temperature. While the cause and effect are similar (heat causes expansion and cold causes contraction), the processes are different. **It is important for teachers to reinforce this so students do not develop misconceptions.** The balloon changes in size due to the particle motion theory. In the body, heat causes the parasympathetic nervous system to stimulate M3 receptors in blood vessels, causing the blood vessels to widen (vasodilation). Cold causes the sympathetic nervous system to release norepinephrine, which binds to receptors on the smooth muscle cells, causing the blood vessels to narrow (vasoconstriction).  
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**Safety Concerns:** There are no particular safety concerns with this activity other than precautions one would use with straws and water.

**Safety Concerns for the Extension Activity**—The hot water does not have to be any hotter than a hot shower. It should not be hot enough to cause any injury.