Dr. Rosie Helps the Animals **The effect of salt phenomenon** **Guided Inquiry Lesson** Teacher Lesson Plan		
Lesson Summary	This is a 2-day lesson based on the book: *Dr. Rosie Helps the Animals*. The first day consists of reading and processing the story with a focus on the various remedies Rosie uses. The second day is a guided inquiry lesson based on a fundamental scientific concept alluded to in the story *Dr. Rosie Helps the Animals*. It employs the phenomenon-based learning approach and gives students a foundational understanding of osmosis.	
Phenomenon-based learning is included in the Next Generation Science Standards (NGSS)		
Phenomenon-based learning using *Dr. Rosie Helps the Animals*	**Day 1**: Read and Process	**Day 2**: The effect of salt phenomenon-based guided-inquiry science lesson

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: salt

Cultural and Linguistic Sustaining Practices

Note: The *Dr. Rosie* 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 content of the book to your students' cultural and linguistic backgrounds.
- ☐ Ask students to make connections to the remedies in the story by relating them to their own cultural experiences
- ☐ Ask relevant and inclusive questions that connect to all students from various backgrounds

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 *Dr. Rosie* story	**Questions**: *Have you ever been sick? What helped you get better?* 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.	Reply to the questions
_____ minutes	Story Reading and Scaffolded note-taking (Remedies Phenomena Pupil Page)	Give each student a copy of the 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 salt phenomenon-based guided-inquiry science lesson

Grades levels: K-2	**Topic:** Effect of Salt Phenomenon	**Materials:** • (per group or as a demo) a piece of plastic, a small cup with salt in it, a gummy bear from the bag, a gummy bear that has been in water for about 3 hours prior to the lesson • Effect of salt phenomena pupil pages

NGSS Standards (Science Practices) K-2

- **Asking questions and defining problems**– *How does salt affect something that has water in it? Why do people use salt (saline spray) to try to unstuff a stuffy nose?*
- **Developing and Using Models**– *A gummy bear can be a model for the inside of a nose.*
- **Planning and carrying out investigations**–*compare the size of a swollen gummy bear (due to extra water) before and after putting salt on it*
- **Analyzing and Interpreting Data**–*What happens to the size of a swollen gummy bear when salt is put on it? What does this mean about how salt affects the size of some things that are swollen due to water being in them?*
- **Constructing Explanations and Designing Solutions**– *When a swollen gummy bear has salt put on it, some of the water particles inside the gummy bear move out. This makes the overall size of the swollen gummy bear smaller.*
- **Engaging Argument from Evidence**– *evidence suggests that salt makes some things that are swollen with water shrink (get smaller)*
- **Obtaining, Evaluating, and Communicating Information**– *If salt makes some things that are swollen with water get smaller, salt drops put into a stuffy nose (swollen due to water) can make a nose less stuffy because they make the swelling go down.*

Lesson Objectives/Learning Goals

- Students will utilize a variety of science practices to investigate the effect of salt on an object swollen with water
- Students will make connections between how salt affects the size of a swollen gummy bear and how salt drops (nasal spray) affect a stuffy nose

To the teacher: *This lesson provides a foundational understanding of osmosis, a higher-grade NGSS content standard. Content that is both general and specific to this guided inquiry is provided below.*

Science Content Background for this Lesson

If someone sprays perfume on one side of a room, eventually, a person on the other side of the room will smell it. If you put a drop of food coloring in water, the particles will spread out over time until they are evenly distributed. These are two examples of **diffusion**, Diffusion is the movement of a substance from an area of **high concentration** to an area of **lower concentration**.

- Diffusion occurs in liquids and gases (whose particles can freely move) when their **particles** collide randomly and spread out.
- Diffusion is an important process for living things – it is one way that **substances** move in and out of cells.

Osmosis is a special kind of diffusion. It is specifically the movement of **water molecules across a selectively permeable membrane** from a region of high water concentration (low solute, fresher water) to a region of low water concentration (high solute). Solute is the name of what is mixed into the water. In the case of salt water, salt is the solute and water is the solvent. A **selectively permeable membrane** is one that allows some substances to move through it but not others. A cell membrane is an example of a selectively permeable membrane. It allows water to move through it but not all substances. ***Osmosis*** helps control the flow of **water** into and out of cells, which is crucial to their survival. If too much water moves into a cell, it might burst. If too much water leaves a cell, it will die.
Osmosis is the reason why water flows into a plant when you water the roots in the soil.

Science Content Directly Related to this Investigation

When you put a gummy bear in water, there is a higher concentration of water (more pure water, less dissolved substances) on the outside of the gummy bear than on the inside. Thus, water moves into the gummy bear causing it to swell. Then, when you take the swollen gummy bear and put salt on it, there is a higher concentration of water inside than outside, so water moves out, causing it to shrink.

Osmosis rap: https://www.youtube.com/watch?v=HqKlLm2MjkI

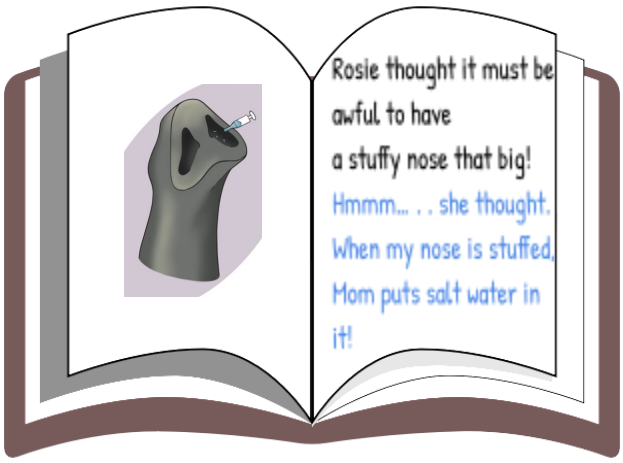
How does this relate to saltwater unstuffing a stuffy nose? A stuffy nose is caused by congestion (build-up of fluid) in the cells (tissues) inside the nose. Various things like illnesses or allergies cause fluid to build up which causes nose tissues to swell. Adding salt water drops causes the fluid to drain from the tissues (due to

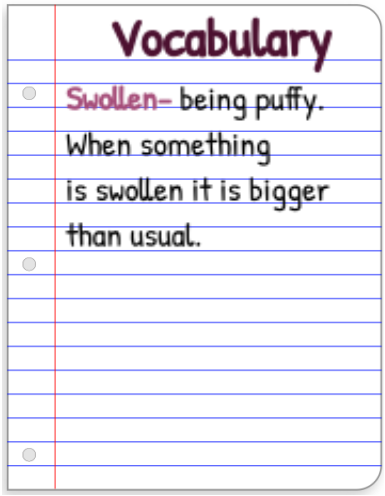
osmosis) thereby reducing swelling or the feeling of stuffiness. Salt drops can also help moisturize the lining of the nose because salt draws water out of cells.

Rosie says, "When my nose is stuffed, Mom puts salt water in it." This is a guided inquiry lesson to test the effect of salt on a gummy bear (or raisin, or Orbeez) and a shell-less egg that are swollen due to water being in them. This is a model for using saline drops to unstuff a stuffy nose.

Pedagogy Style: Guided Inquiry

Excerpt from Dr. Rosie Helps the Animals





Experiment 1:

The effect of salt on the size of a gummy bear (the same procedure can be done with raisins and Orbeez, but it takes longer and the results are not as obvious),

Note to the teacher: *Before starting the experiment, here are some possible questions to ask students:*

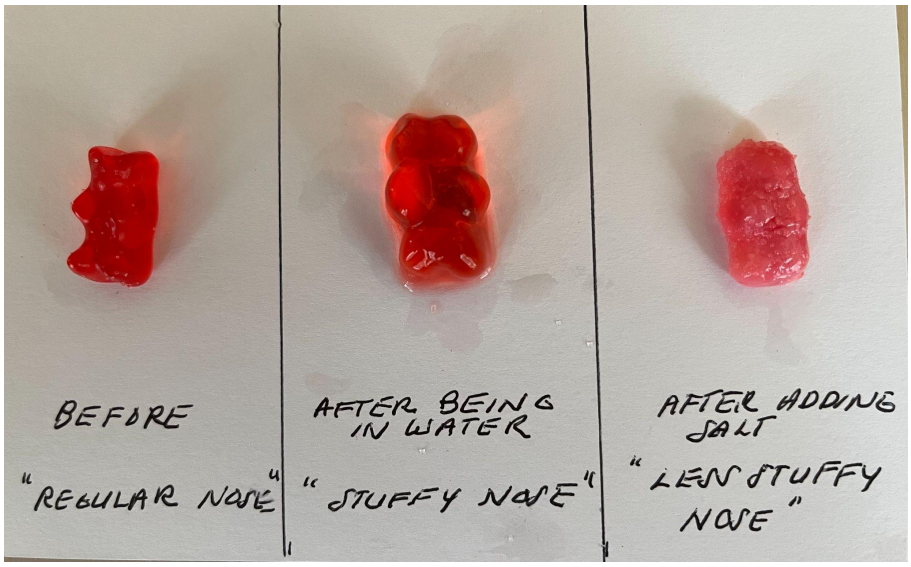
1. What do you think will happen to the size of a gummy bear if it is put in water for a while? Will it stay the same? Will it get larger? Will it get smaller?
2. What do you think will happen to a swollen gummy bear when salt is put on it? (The gummy bear is swollen because it is filled with water.) Will it stay the same? Will it get larger? Will it get smaller?

Materials for the Experiment:

- Gummy bears (2x the number of students or student groups)
- Water
- Salt
- Spoon
- Pieces of plastic (plastic wrap or sandwich bags are fine)
- Effect of salt pupil page

Note the teacher: **You will need to do some prep before this experiment.**

1. Get a large bowl. Add water.
2. Put as many gummy bears (preferably red and green because they are easier to see in general) in the water as there are students, student pairs, or table groups. There should be ample water in the bowl and the gummy bears should be completely submerged.
3. Leave the gummy bears in the water between 3 and 5 hours before starting the experiment with the kids. If you leave them in for a long time (over 7 hours), they become GIANT (really cool but mushy) and you cannot use them.
4. Give each student (pair, group) a regular gummy bear (out of the bag). Have the students put it on a piece of plastic.
5. Check first to make sure the gummy bears in the water are swollen enough that kids can notice a difference in size. Then, go around to each student (pair, group) and, using a spoon, gently take out one of the gummy bears that has been in the water. Carefully, pour off any excess water that is in the spoon and put the swollen gummy bear on the student's piece of plastic near the one from the bag. Try not to have any water on the plastic before putting salt on the gummy bear. This way, students can see that the water that ends up on the plastic must have come from the gummy bear.
6. Ask students what they notice about the size of the gummy bear that has been in the water. (It is bigger.) Then, ask them how they think it happened. (It filled with water or water went inside.)
7. Have students (or you) put salt on the top of the gummy bear. Then, put some salt on the plastic itself, and slide the gummy bear on top of the salt so there is some underneath it.
8. Leave the set-up alone.
9. Observe what happens to the salted gummy bear over time.
10. Students can start working on The Effect of Salt Phenomenon Pupil Page



Making Connections:

1. What happens to the size of a swollen gummy bear (filled with water) when salt is put on it?
2. Pretend that a swollen gummy bear is like a stuffed nose. Why is salt used to try to unstuff a stuffy nose?

Experiment 2:

The effect of salt on the size of a shell-less swollen egg

Note to the teacher: *Before starting the experiment, here are some possible questions to ask students:*

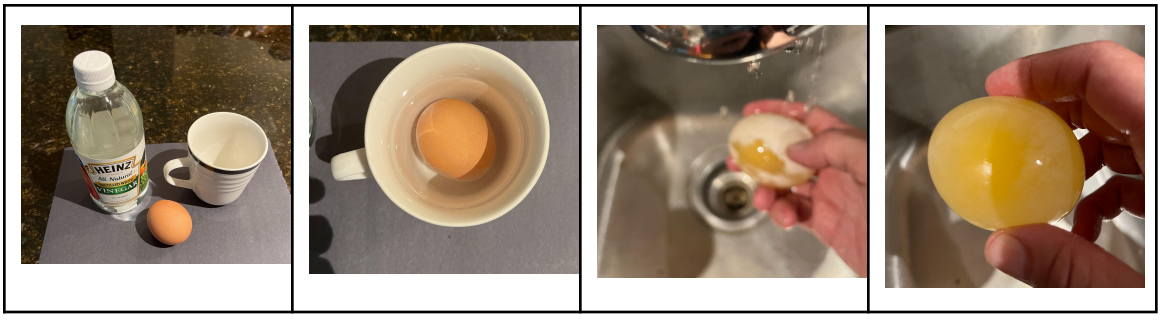
1. What do you think will happen to the size of a shell-less swollen egg when salt is put on it? Will it stay the same? Will it get larger? Will it get smaller?

Materials for the Experiment:

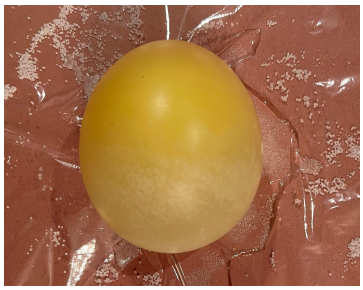
- One raw egg (if this is done as a demonstration) OR several raw eggs (if kids, lab groups, etc. each get one)
- Vinegar
- Bowl
- Salt,
- Paper towel
- Pieces of plastic (plastic wrap or sandwich bags are fine)

Note the teacher: You will need to do some prep before this experiment.

1. Put vinegar in a bowl. Put a raw egg in it. Let it stand for two days. The vinegar and calcium carbonate of the shell react with each other (creating calcium acetate), so the shell seems to disappear.
2. If, after two days, some shell is still on the egg, carefully rub the egg under running water so the shell comes off completely and exposes only the egg membrane.



3. You will notice that a shell-less egg is a lot larger than when it has a shell. This is because vinegar is mostly water–(4-7% acetic acid and 93-96% water) so, through osmosis, water moves into the egg once the shell is off.
4. Dry off the shell-less egg with a paper towel then put it on plastic wrap.
5. Have students (or you) put salt on the top of the egg and some underneath if you can manage it.
6. Let the set-up alone. Observe what happens over time.

 The shell-less egg on the right is swollen because water moved into it through the process of osmosis	 The swollen shell-less egg should be carefully dried off before salt is put on it. This way, any water that appears on the outside is due to water moving out of the egg.	 Over time, there will be water on the plastic. This is the water that moved out of the egg due to osmosis. The egg is also smaller due to the water loss.

Making Connections:

1. What happens to the size of a swollen egg when salt is put on it? Why?
2. A stuffy nose is like a swollen egg. If your nose is stuffed, it means that the inside of your nose is swollen because your body sends water with germ fighters to your nose to help fight off germs or things you are allergic to. If the swollen egg is like a stuffy nose, why is salt used to unstuff people's noses?
3. Challenge: Just like the inside of your nose, the gummy bear and the egg both got smaller when salt was put on them. Which is more like the inside of your nose, the gummy bear or the egg? Explain.

Challenge Connection: Living things, even germs, need water to live. What do you think happens to the water inside a germ when salt is put on it? Does the water move into or outside of the germ? If water moves out of a germ so it does not have water, what might happen to the germ?

Salt water can be used to kill germs. Can you explain why?

Safety Concerns: There are no special safety concerns with this activity.