

Lesson 7 – Elephant Toothpaste

Overview

Video for training: [How to Make Elephant Toothpaste: Conduct Your Own Experiment](#)

This lesson is about independent and dependent variables. We manipulate the independent variable to produce an effect on the dependent variable. Scientists want to know how variables influence one another. In an experiment, the independent variable is the variable that is manipulated to produce different conditions. Scientists compare how the different conditions influence the dependent variable. For example, scientists conduct experiments to compare whether getting a flu shot (or not; independent variable) can prevent people from getting the flu (dependent variable).

To learn about experiments, independent and dependent variables, UQUEST scientists will make elephant toothpaste and measure reactions depending on solution used. After completing the lesson, UQUEST scientists will understand how the independent and dependent variables fit into the design of an experiment.

Science Objectives

UQUEST scientists will:

- understand that we change an independent variable and observe a dependent variable.
- understand that the independent variable is manipulated to produce a measured outcome in the dependent variable.

Health Messages:

- Scientists recommend that to have the healthiest teeth possible, kids should brush their teeth in the morning and at night

Reinforcement of previous messages:

- Variables (Lesson 3) - Variables are characteristics of objects we observe
- Measurement (Lesson 5) - Measurement is very important in science

Vocabulary

- **Independent variable** - the variable that is changed
- **Dependent variable** – the variable that is observed

Materials

- UQUEST kit
- Measuring cups
- Tablespoons and teaspoons

- Empty water bottle (1-4 per group)
- Food coloring (need 5 drops per water bottle)
- Active dry baking yeast (need 1.5 teaspoons OR .25 oz packet per water bottle)
- Hydrogen peroxide (need ½ c per water bottle)
- Warm water in a thermos (need 3 tablespoons per water bottle)
- Cups – for the warm water
- Paper plates to prevent messes
- Napkins for messes
- Toothpaste
- Dish soap

Preparation

At UM:

- Gather all materials (note: 2 sets of materials for each team – because splitting between warm water and cold water)
- Prepare warm and cold water

At OYC:

- Set up tables

Introductory Script (~3 mins):

Welcome UQUEST scientists.

Remember the lab notebook is an important tool that scientists use to record their observations and the results of their experiments.

Let's open up your lab notebooks to the second page. Like all scientists, UQUEST scientists pay attention to the world around them. They create an environment that helps them to learn about the world. They listen to each other. They communicate with each other. And they treat each other with respect.

Let's review the values of a UQUEST scientist. Each UQUEST scientist reads OUT LOUD one value.

1. **Pay attention** when others are talking.
2. **Speak in a low voice.** Do not scream.
3. **Respect each other.** Do not push or shove each other.

Be sure to praise the students when they do well and tell them why

Relaxation (~2 mins)

Before we begin the lesson, we'd like to start off by doing a relaxation activity. When scientists are relaxed, they do better science.

For today's relaxation activity we will practice belly breathing.

- Guide the UQUEST scientists, through some belly breathing for ~1 minute.

Instructions for UQUEST Guides

1. Introduction (5-10 mins)

- To start, ask everyone about tooth brushing; is it enjoyable? How frequent? Your favorite toothpaste?
- Today we will be making elephant toothpaste. It's not REAL toothpaste, but if elephants brushed their teeth, they would need extra huge toothpaste!
- We will observe the reaction to examine if warm water or cold water is better for making elephant toothpaste.
- Today, we are going to learn about 2 different types of variables.
 - Remember, variables are the characteristics of objects or people that can differ among them. Remember that in lesson 4, we observed the variables of the UQUEST guides, or what is different between the UQUEST guides.
- The **independent variable** is the variable that is changed to produce a reaction. In this experiment, we are changing the temperature of the water to make the toothpaste: warm or cold.
- The **dependent variable** is the result that we observe. The dependent variable **DEPENDS** on the independent variable. The thickness of the elephant toothpaste will **DEPEND** on the independent variable, or the temperature of the water that we add.
- Let's make sure we understand:
 - Which variable in our experiment is the **independent variable**, or the variable that we change?
 - The temperature of the water—warm or cold.
 - Which variable in our experiment is the **dependent variable**, or the variable that we observe?
 - The thickness of the elephant toothpaste – 1-5
- Show notecard to scientists to make the concepts clear.



2. Activity (~20 mins)

- a. *We are going to make the toothpaste solution with the warm water AND with the cold water and observe the toothpaste thickness.*
 - i. **NOTE:** Experiments will be done simultaneously (split group in two and have them do activity with cold and warm water at the same time)
- b. *The temperature of the water is our **independent variable**, because we change it – show notecard - and the **dependent variable** is what we observe the thickness of the toothpaste reaction – show notecard.*
- c. *We are going to measure and prepare all of our ingredients first. We will work as a team.*
- d. **Prepare materials - Assign scientists a task and have them begin:**
 - i. One scientist measures half a cup of hydrogen peroxide
 - ii. One scientist measures 1 teaspoon of dish soap
 - iii. One scientist measures 1.5 teaspoons of yeast
 - iv. One scientist mixes 3 tablespoons of warm water with yeast
- e. **Conduct experiment - Assign scientists a task:**
 - i. First, one scientist pours half a cup of hydrogen peroxide into the bottle
 - ii. Second, one scientist pours 5 drops of food coloring into the bottle
 - iii. Third, one scientist pours 1 teaspoon of dish soap into the bottle
 - iv. Finally, one scientist pours the warm water yeast solution into the bottle.
- f. **Instruct scientists to observe the thickness of the elephant toothpaste coming out of both bottles**
- g. **Instruct scientists to record their observations and complete the questions on page 7B.**
 - i. Identify IV and DV
 - ii. Rate elephant toothpaste thickness on a scale of 1-5

3. Documentation (~10 mins)

- a. **Direct scientists to page 7C in the lab notebook and ask if they recall parts of the graph.**
 - a. *First, we have the title (**point to title**), which shows the data we are trying to present. It says: Does water temperature affect elephant toothpaste thickness?*
 - b. *Next, we have this line called the x-axis that goes from side to side (**slide finger along the x-axis**), which will show the two conditions of the independent variable, or water temperature: Warm and cold.*
 - c. *Last, we have this line, called the y-axis, which goes up and down (**point to y-axis**). This will represent the thickness of the elephant toothpaste, which is the dependent variable – what we observe.*
 - d. *Make a bar above “warm” with the thickness of the elephant toothpaste when using warm water.*
 - e. *Make a bar above “cold” with the thickness of the elephant toothpaste when using cold water.*
 - f. *What do you observe? Which bar is taller?*

4. Discussion (~10 mins)

- a. *Now let's discuss what we did today. I will ask some questions, and if you answer, you get a sticker. At the end, the stickers can be traded in for a special prize. Let's GO!*
 - i. **Award sticker for every question answered.**
 - ii. **Note:** below are example questions. You can ask additional questions not listed.
- b. **Why do you think that the warm water worked?**
 - i. *Because warm water activated the yeast. When the warm water hits the yeast, it reactivates it and "wakes it up." Then the yeast organism begins to grow. As it grows, it releases chemicals and gases like carbon dioxide and ethanol.*
- c. **What is an independent variable?**
 - i. *Variable that we change.*
- d. **What was the independent variable of our quest today?**
 - i. *Water temperature (warm or cold)*
- e. **What is a dependent variable?**
 - i. *The variable that we observe after changing the independent variable.*
- f. **What was the dependent variable of our quest today?**
 - i. *Thickness of elephant toothpaste*
- g. **What do you think is easier? Brushing the teeth of an elephant or brushing your own teeth?**
- h. **How often do you brush your teeth?**
 - i. *Scientists recommend that to have the healthiest teeth possible, kids should brush their teeth in the morning and at night. Each time that you brush your teeth, you should brush for at least two minutes.*
- i. **Which temperature of water makes elephant toothpaste thicker?**
 - i. *Warm*

Wrap-up

- j. *What did you learn today? Write that down on the lines on page 7D.*
- k. *How much did you like today's lesson on scale from strongly agree to strongly disagree.*
- l. **Award prize at the end based on number of stickers.**

Lesson 7

Elephant Toothpaste



Date: _____



Experimentation

1. What is the independent variable? Circle one:

Water temperature

Elephant toothpaste thickness

2. What is the dependent variable? Circle one:

Water temperature

Elephant toothpaste thickness

3. Rate the elephant toothpaste thickness on a scale of 1-5 when we used WARM water. Circle a number:

1

2

3

4

5

Not thick

Very thick

4. Rate the elephant toothpaste thickness on a scale of 1-5 when we used COLD water. Circle a number:

1

2

3

4

5

Not thick

Very thick

5. Was the elephant toothpaste thicker when we used cold or hot water? Circle one:

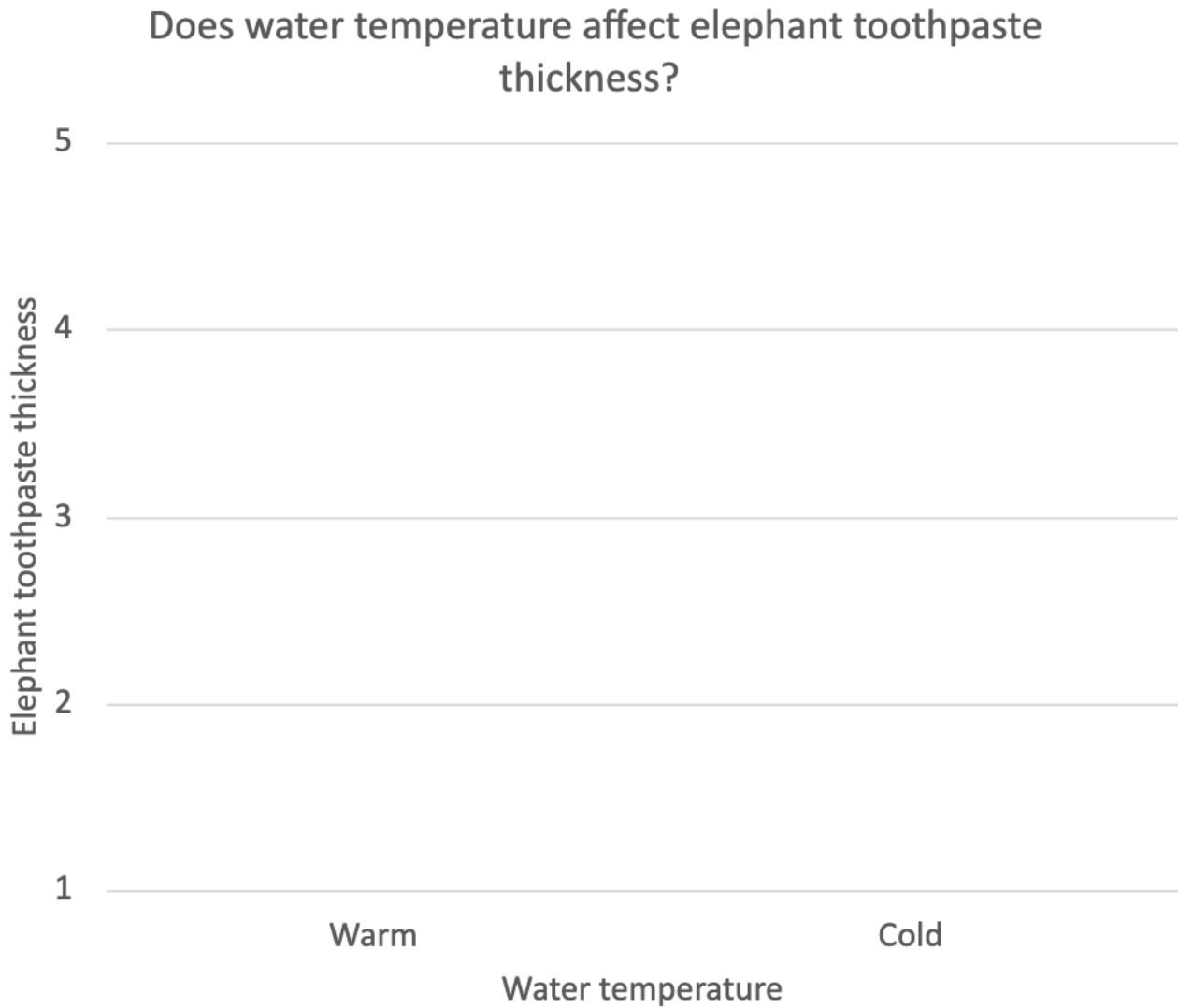
Warm water

Cold water

Date: _____



Graphing



Date: _____

Lesson 7

What did I learn today?

I liked this lesson (circle one):

**Strongly
Agree**



Agree



Disagree



**Strongly
Disagree**

