

name \_\_\_\_\_

## Time Frame

2-3 class periods

## Overview

Students will conduct a series of scientific investigations, gather evidence and write to explain what they have learned about the unique properties of eggs.

## Objectives

- Students will make observations and conduct several scientific investigations.
- Students will identify and explain the unique properties of eggs based on their scientific investigations.
- Students will write and illustrate a book to explain what they have learned.

## Materials

- Chart paper
- Markers Paper
- Art materials
- “Detective’s Logbook” student handout (one per student)
- Two dozen eggs (four of them hard boiled)
- Bowl
- Rulers (one per group)
- Six inch pieces of string (one per group)
- Scales (one per group)
- Clear glass or jar
- Hot water
- Magnifying glass



## Lesson Background

An egg's shell covers and protects what's inside the egg. An egg's yellow center is called the yolk. It contains about half the egg's protein, most of its vitamins, some of its minerals and all of its fat. The clearish-white liquid around the yolk is called the egg white or albumen. It contains a little more than half the egg's protein, plus some of its vitamins and minerals.

Eggs range in size from peewee to jumbo. Younger hens tend to lay smaller eggs. The size increases as the hen grows older and bigger. Following are the weights associated with each egg size:

- Jumbo - 30 oz.
- Extra large - 27 oz.
- Large - 24 oz.
- Medium - 21 oz.
- Small - 18 oz.
- Peewee - 15 oz.

There are seven to 17,000 tiny pores on an eggshell's surface, a greater number at the large end. As the egg ages, these tiny holes permit moisture and carbon dioxide to move out and air to move in to form the air cell. The egg can also absorb refrigerator odors through the pores.

An eggshell is very thin. It's composed of calcium carbonate. Vinegar is an acid. When an egg is placed in vinegar, the acid reacts with the eggshell's calcium to form the gas carbon dioxide. Gas bubbles appear on the shell and rise to the surface. Over a period of 35 to 48 hours, the entire eggshell dissolves, exposing the shell membrane which holds the soft insides of the egg. When the soft egg is put in water, water moves through the shell membrane by osmosis, causing the egg to swell. It will eventually become too full and break like a balloon.

## Engage (15-20 minutes)

**Note:** Before class starts, hang four sheets of chart paper around the room with markers beside them. Next to each sheet of chart paper, place a hard-boiled egg with one of the following questions written on it:

- What's inside of me?
- Are all of my friends the same size?
- Does my shell have any holes?
- Would I look different if I swam in vinegar? If so, how?

1. Explain to students that their help is needed to solve a mystery! Four eggs were mysteriously left in the classroom overnight. Each egg has a question written on it. Their job is to work together to answer the questions like real detectives would. Each answer will help them learn what is unique and special about eggs.
2. Divide students into four groups, and direct each group to stand by one of the pieces of chart paper. Ask a volunteer at each station to read aloud the question written on the egg at that station. Teachers may need to read the questions aloud to younger students.
3. Using the markers and chart paper, have each group predict an answer or answers to the question.
4. Rotate groups among all signs, giving each group a chance to predict answers to all questions. Review predictions together with the class, and encourage students to guess which ones they think are most accurate for each question.

## Explore (30-40 minutes)

1. Distribute the “Detective’s Logbook” student handout. Explain to students that, just like real detectives, they must use inquiry and observation to learn as much as they can about what is unique and special about eggs.
2. **Review question 1:** What’s inside of me? Ask students how they might learn what’s inside of an egg. If they don’t suggest cracking one open, guide them in that direction. Then conduct the following demonstration:
  - Crack a raw egg into a bowl, and let students observe what’s inside.
  - Ask students to describe to a partner what they see.



• Then, direct students to draw and label each of the following parts in their Detective's Logbook:

- **Shell** - Protects and covers the egg. Made of calcium carbonate.
- **Yolk** - Yellow center. Produces food for the embryo. Major source of vitamins and nutrients.
- **Albumin** - Clear white liquid around the yolk. Protects the yolk and provides additional nutrition.

3. **Review question 2:** Are all of my egg friends the same size? Ask students how they might learn the answer to this question. One way to compare egg sizes is to measure them. Hold up an egg and ask students to name all of the different ways they could measure it. Ideas include measuring length, width and even weight. For each measurable attribute, ask student volunteers for ideas of objects they could use to measure. For example, they could measure an egg with a ruler, their finger, a piece of string or even a set of blocks. Once students have given several ideas for ways to measure the egg, follow the steps below:

- In their groups, ask students to pick out three or four eggs that appear to be the same size.
- Demonstrate how to use string to measure the eggs vertically and horizontally. Put a ruler down on the table or desktop. Use a piece of string to go around the middle or horizontal area of an egg. Put a felt-tip mark on the end of string that matches up with the beginning of it. Then put the string along the edge of the ruler and see how long it is. Write down this measurement by "Egg 1" on the handout.
- Show them how to measure the egg vertically, mark and measure. Record the measurement on the handout.
- Have the students do the same thing with the rest of the eggs, keeping measurements and observations in their Detective's Logbook.
- Then, direct students to use the scale to weigh each egg and record the weight of each egg in the Logbook. Note: To prevent eggs from rolling off of the scale, you may want to weigh a cup and then have students weigh the eggs inside of the cup.

4. **Review question 3:** Does my shell have any holes in it? Ask students how they might learn the answer to this question. Then, conduct the demonstration below.

- Place the egg carefully into the glass or jar.
- Carefully pour hot water into the glass or jar until it is nearly full.
- Leave the glass or jar on a table or flat surface and watch the egg closely for a few minutes (the glass may become hot so be careful).

- Direct students to record or draw their observations in the Logbook. Note: After surrounding the egg with hot water, they should observe tiny bubbles forming on the egg shell which eventually bubble their way to the surface. Explain to students that an egg contains a small air pocket at its larger end between the shell and egg white. When the air trapped inside this small pocket begins to heat up it expands and tries to find a way out of the shell. Ask students how they think the air escapes.
- Let students take turns using a magnifying glass to examine the egg. See if they can identify small pores on the shell. Direct students to add to their observations.

5. **Review question 4:** What would happen if I swam in vinegar? Ask students how they might find out the answer to this question. Guide them toward understanding that they could dip an egg in vinegar. Then, conduct the following demonstration. Explain to students that this demonstration may take one to two days to complete.

- Place a raw egg in a jar, add enough vinegar to the jar to cover the egg, and replace the jar lid. Ask students what they see and have them record their observations in their Detective's Logbook. The shell is covered with tiny bubbles of carbon dioxide, some rising to the surface. Ask students to look at the jar after 36 to 48 hours and add to their observations. They will likely notice that the shell will dissolve.
- What does this demonstration tell them about the properties of eggs?

## Explain (20 minutes)

Divide students back into their four groups, and direct each group to stand by a different sign/egg from the beginning of the activity. First, ask the group to discuss among themselves what they learned from the demonstration and their observations about the unique properties of eggs. Then, have each group explain what they learned to the rest of the class. Allow students to ask questions or add to each other's explanations.

## Elaborate (20-25 minutes with additional time if the investigation is conducted)

1. Work with the class to identify one additional question they could ask to help them learn more about what is unique and special about eggs. Examples include:
  - Does the weight of a raw egg change when it's hard boiled?
  - Can you crush an egg in your hand?



- Will an egg roll at different speeds on different surfaces?
  - Will eggs roll in a straight line?
2. Challenge students to design an investigation that could help them answer the question they have identified. List the steps to the scientific process together on the board. Steps include:
    - Ask a Question
    - Construct a Hypothesis
    - Test Your Hypothesis by Doing an Experiment
    - Analyze Your Data and Draw a Conclusion
    - Communicate Your Results
  3. Talk with students about different ways to organize and collect their data. Ideas include using tally marks, bar graphs, tables or pictographs. Once the data is organized, students need to draw conclusions about what the data is saying. Encourage students to use words like more, most, less, least, same and different as they describe their data.
  4. Conduct the investigation and record the results in the Detective's Logbook.

## Evaluate (20-30 minutes)

Finally, tell students that they will write and illustrate a book that informs readers about the unique properties of eggs. Their book must include at least four pages and a title page. Each page should include one to three sentences about something unique and special about eggs. Each page should also include an illustration. For example, one page may say, "Egg shells have holes. I know this because I saw eggs release air bubbles from the holes when put in water."

## Standards

### CCSS ELA Standards

- **CCSS.ELA-Literacy.W.K-3.2** - Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.
- **CCS.ELA-Literacy.W.K-3.8** - Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.





## Be a DetEGGtive!

- **CCSS.ELA-Literacy.SL.K-3.1** - Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
- **CCSS.ELA-Literacy.SL.K-3.3** - Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.
- **CCSS.Literacy.SL.K-1.5** - Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.

### CCSS Math Standards

- **K.MD.1** - Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object.
- **K.MD.2** - Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference.
- **1.MD.1** - Order three objects by length; compare the lengths of two objects indirectly by using a third object.
- **1.MD.4** - Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.
- **2.MD.1** - Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks and measuring tapes.
- **2.MD.4** - Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit.

### Next Generation Science Standards Framework

- **Core Idea: PS1** - Matter and Its Interactions
  - **PS1: A** - Structure and Properties of Matter
  - **PS1: B** - Chemical Reactions
- **Core Idea: LS1** - From Molecules to Organisms: Structures and Processes
  - **LS1.A** - Structure and Function
  - **LS1.C** - Organization for Matter and Energy Flow in Organisms

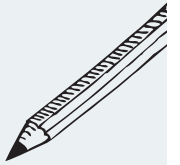


# Detective's Logbook

Are you ready to be a detEGGtive? Your help is needed to solve an egg mystery! Four eggs have been left in your classroom with questions on them. You will make observations and answer questions to help you learn about the unique properties of eggs. Record your observations in this Detective's Logbook.

**Question 1: What's Inside of Me?**

What's inside of a raw egg? Do you know the parts of an egg? Your teacher will crack open an egg. Look at the parts of the egg. Draw and label the parts below. Then describe each part. Use these words: shell, yolk and albumen.



**Question 2: Are All of My Friends the Same Size?**

Do you think that all eggs are the same size? Measure and weigh several eggs. You can use eggs from the same carton or a different carton. Record your observations below.

	Vertical Measurement	Horizontal Measurement	Weight
<b>EGG 1</b>			
<b>EGG 2</b>			
<b>EGG 3</b>			
<b>EGG 4</b>			

What does your data tell you about the sizes of eggs?





### Question 3: Does My Shell Have Any Holes?

Do you think eggshells have holes? Why or why not? Your teacher will perform a demonstration with an egg in water. Record or draw what you see below. How does this demonstration help you know if eggs have holes?



### Question 4: Would I Look Different If I Swam in Vinegar? If So, How?

What do you think would happen to an egg if it was dipped in vinegar? Would it look the same or different? Your teacher will do a demonstration. Record or draw your observations below.

Did your observations help you answer the question?

Congratulations! You are a great “detEGGtive!” What are three things you learned about the properties of eggs?

- 1.
- 2.
- 3.

