



Eggcellent Experiments Lesson Plan for Homeschool

Overview

Raddish is designed by a dedicated team of teachers and chefs who believe the kitchen classroom is the tastiest place to learn. We love watching learning come alive when kids mix math, stir science, and taste culture!

Paired with the materials found in your Eggcellent Experiments box, this lesson plan divides your box into 3 45-90 minute lessons you can use and adapt to support your homeschool study, pre-k – middle school. Depending on your timeframe and child's age and engagement, these can be taught together or separated for a longer lesson. Please refer to the curriculum provided in your box: recipe guides, activity card, and introduction card. Happy cooking! Happy learning!

Lesson 1: Crispy Chicken Tenders and Corn Flakes Explored

Activity Time: 60-90 minutes

Learning Outcomes

- Students will learn the history of the invention of cereal by Dr. John Harvey Kellogg.
- Students will learn how corn flakes are made.
- Students will learn and use the terms *fortified*, *insoluble* and *magnetic*.
- Students will locate and explore the information included in the Nutrition Panel on a cereal box.
- Students will conduct an experiment to discover if and why corn flakes may be magnetic!
- Optional- Students will compare and contrast different cereals to determine if they are more or less magnetic than corn flakes and why.
- Students will learn about iron and why our bodies need it.
- Students will make and share Crispy Chicken Tenders with family and friends.

Materials

- Recipe guide, ingredients, and tools listed within.



- Corn flakes and other types of cereal you may have on hand.
- Experiment 1
 - Experiment 1 - Procedure and worksheet (included)
 - Corn flakes
 - A bowl
 - Water
 - Magnet
 - (Optional) other kinds of cereal
- Experiment 2
 - Experiment 2 - Procedure and Worksheet (included)
 - 2 cups corn flakes
 - Resealable plastic bag
 - Rolling pin
 - Measuring cup
 - Warm water
 - Magnet (*a super strong Neodymium Magnet works best- can be found on Amazon.com*)
 - *Optional*
 - Other types of cereal for comparison
 - Duct Tape
- Optional books for further research:
 - Picture Books:
 - Magnets- Pulling Together, Pushing Apart by Natalie M. Rosinsky
 - What Magnets Can Do by Allan Fowler
 - What Makes a Magnet by Franklyn M. Branley
 - Non-Fiction Books:
 - Child Friendly Reading Kellogg Family: Breakfast Cereal Pioneers by Joanne Mattern
 - The Great American Cereal Book by Marty Gitlin and Topher Ellis
 - Cerealizing America: The Unsweetened Story of the American Breakfast Cereal by Scott Bruce

Resources

- Timeline of Kellogg's Company https://www.kelloggs.com/en_US/who-we-are/our-history.html
- A Historical Overview <http://www.kellogghistory.com/history.html>



- Dr. John Harvey Kellogg – Inventor of Kellogg’s Corn Flakes
<http://library.uthscsa.edu/2014/05/dr-john-harvey-kellogg-inventor-of-kelloggs-corn-flakes/>
- Nutrition Facts <http://www.eatright.org/resource/food/nutrition/nutrition-facts-and-food-labels/the-basics-of-the-nutrition-facts-panel>
- Minerals in your food and body www.Kidshealth.org/en/kids/minerals.html#
- Fat and Water Soluble Vitamins <http://kidshealth.org/en/kids/vitamin.html#>

Videos

- How It’s Made- Cereal (5:29) https://www.youtube.com/watch?v=HPpMV_vcVEg
- Cornflake Kings- The Kellogg Brothers (45:48)
<https://www.youtube.com/watch?v=Pgygluf8b8E>
 - Teacher should watch first and choose appropriate sections for interested older students.
- What Are Fortified Foods? Definition & Examples- Video (5:50)
<http://study.com/academy/lesson/what-are-fortified-foods-definition-examples.html>

Experiments Sourced From

- Magnetic Corn flakes [http://www.eng-atoms.msm.cam.ac.uk/Fun/Tryathome/Corn flakes](http://www.eng-atoms.msm.cam.ac.uk/Fun/Tryathome/Corn%20flakes)
- <http://weirdsciencekids.com/Ironbreakfast2.html>

Introduction- What is Cereal?

- **Bring** a box of corn flakes and other cereals to explore.
- Students can do the following activity in pairs or individually, they can give their answers orally or write them down.
- **Tell** the students:
 - Imagine that friendly aliens have landed on earth and are visiting their home. It is breakfast time and you have set the table with a number of cereal options for them to choose from. The aliens look at the boxes in front of them and have no idea what to do!
 - Your job is to explain to them what cereal is. What is it made from? How is it made? How do you eat cereal? Why it is a good choice of food for breakfast?
 - Explain to the aliens what your favorite cereal is and why.
 - Have students share their answers.



- **Share:** Today we are going to not only be learning about the invention of breakfast cereal but also do two experiments to discover some interesting properties about cereal.

Creating Corn Flakes

- **Read** the **Creating Corn Flakes** section of the Crispy Chicken Tenders recipe guide.
 - **Ask:** Did you know that cereal was invented so long ago?
 - **Ask:** Do you recognize the name of the person that invented corn flakes?
- **Share:** How were Corn Flakes invented?
 - In 1894, Dr. John Harvey Kellogg was the superintendent of the Battle Creek Sanitarium (a sanitarium is a medical facility for long-term illness) in Michigan. He and his brother, Will, were searching for wholesome foods to feed the patients.
 - One day Will accidentally left some boiled wheat sitting out and it went stale. Rather than throw it away, the brothers sent it through some rollers, hoping to make long sheets of dough, but they got flakes instead. They toasted the flakes, which were a big hit with the patients.
 - They patented (a patent is a government license that gives the right, for a set period of time, to exclude others from making, or selling an invention) the flakes under the name Granose.
 - The brothers experimented with other grains, including corn, and in 1906, Will created the Kellogg company to sell corn flakes.
 - John refused to join the company because he felt that Will lowered the health benefits of the cereal by adding sugar.
- **Watch** the video: How It's Made- Cereal (5:29)
https://www.youtube.com/watch?v=HPpMV_vcVEg
 - Have students refer back to the **Creating Corn Flakes** section of the Crispy Chicken Tenders recipe guide.
 - **Ask:**
 - Did you see all of the steps you read about?
 - Were there any steps that were not included? (spraying the flakes)
 - Why did they spray the flakes? What did they spray them with? Why?



- **Share:** Most cereals have been *fortified*. This means that extra nutrients have been added to the food.
 - This is done because a bowl of cereal does not have all of the nutrition that you need to start your day. Food scientists have learned how to add in the vitamins and minerals that your body needs for it to grow and develop.
- **Look** at the Nutrition Facts Panel on a box of cereal.
 - **Ask:** Can you find the names of any vitamins or minerals there? (Thiamin/Vitamin B1, Riboflavin/Vitamin B2, Folate, Iron etc.)
 - *Also available online with an explanation:*
<http://www.eatright.org/resource/food/nutrition/nutrition-facts-and-food-labels/the-basics-of-the-nutrition-facts-panel>
- **Say:** Next we are going to do two experiments to see if we can discover any of these fortifications in our cereal.

Corn flakes experiments

- **Magnetic corn flakes**
 - Read Experiment 1 Procedure (included).
 - Help Younger Students to complete the experiment and worksheet (included).
 - Older students can complete the experiment and worksheet independently.
- **Iron Extraction from Corn Flakes**
 - Read Experiment 2 Procedure (included).
 - Help Younger Students to complete the experiment and worksheet (included).
 - Older students can complete the experiment and worksheet independently.

Extension Ideas

- History of the Kellogg Brothers- **Teacher should watch first and choose appropriate sections for interested older students.** Cornflake Kings- The Kellogg Brothers (45:48) <https://www.youtube.com/watch?v=Pgygluf8b8E>
- What Are Fortified Foods? Definition & Examples- Video (5:50)
<http://study.com/academy/lesson/what-are-fortified-foods-definition-examples.html>



- Learn how to read and understand the Nutrition Facts Panel:
<http://www.eatright.org/resource/food/nutrition/nutrition-facts-and-food-labels/the-basics-of-the-nutrition-facts-panel>

Kitchen Prep

- Read the Crispy Chicken Tenders recipe card together.
 - Identify and gather ingredients.
 - Gather tools.
 - Read the **Featured Culinary Skill- Breading Procedure.**
 - Discuss kitchen safety. Specifically, oven safety (Visit Raddishkids.com/pages/safety).
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- **Prepare Crispy Chicken Tenders**
 - Ask children to read or describe each step.
 - Together, follow the steps in the recipe.
 - Give each child a turn to whisk, crush, and bread.
 - When the Crispy Chicken Tenders are ready, eat, taste and share!
 - While friends are eating share with them the history of how corn flakes were invented. Tell them that they are eating metal! Explain to them how you know.



Lesson 2: Scientific Chef's Salad and Eggsperiments

Activity Time: 60-90 minutes

Learning Outcomes

- Students will learn and describe the physical characteristics of an egg.
- Students will learn the name and purpose of the *shell, albumen, chalazae, yolk, inner and outer membranes, air cell, and vitelline membrane*.
- Students will apply what they learned about the physical characteristics of an egg to effectively peel a hardboiled egg.
- Students will conduct one or more experiments and develop explanations using their observations and what they already know about the world.
- Students will learn about **air pressure** through an experiment.
- Older students will learn the **combined gas law**, which describes the mathematical relationship between the volume, pressure and temperature of a gas.
- In the **Featured Culinary Skill** students will learn **Peeling Eggs**.
- Students will make Scientific Chef's Salad to share with their friends and family.

Materials

- Recipe guide, ingredients, and tools listed within.
- For the Egg in a Bottle Experiment:

Younger Students

- Glass bottle with an opening slightly smaller than the egg
- One peeled hardboiled egg per student
- A little dish of water or tiny bit of vegetable oil
- A twist of paper
- A lighter or matches (adult supervision)

Older Students

- Glass bottle with an opening slightly smaller than the egg
- One peeled hardboiled egg per student
- A twist of paper
- A lighter or matches (adult supervision)
- An apron or lab coat
- Heat resistant gloves or tongs
- A pot of boiling water



- For the Egg Drop Experiment:
 - A dozen eggs
 - A yard stick/tape measure
 - Paper towel
 - Assorted items chosen by student
- Optional Picture Book
 - An Egg is Quiet by Dianna Ashton and Sylvia Long

Resources

- The Exploratorium explains the anatomy of an egg <https://www.exploratorium.edu/cooking/eggs/eggcomposition.html>
- Gas laws explained http://encyclopedia.kids.net.au/page/ga/Gas_laws
- More Egg Related Lessons for Preschool and Kindergarten <http://www.aeb.org/educators/lesson-plans-and-materials/114-educators/lesson-plans-materials/543-pre-k-and-kindergarten-lesson-plans>
- Virtual Egg Farm Field Trips <http://www.aeb.org/educators/farm-to-table-virtual-field-trips>
- Book and lesson plan <http://sciencenetlinks.com/lessons/an-egg-is-quiet/>
- More Egg Related Lessons for Preschool and Kindergarten <http://www.aeb.org/educators/lesson-plans-and-materials/114-educators/lesson-plans-materials/543-pre-k-and-kindergarten-lesson-plans>

Videos

- Using a Model of a Chicken How an Egg is Made (1:29) https://www.youtube.com/watch?v=I_D1qTNDyJc
- How do you keep an egg from breaking? Experiment (4:40) https://www.youtube.com/watch?v=7Wn0KS_eWVc
- Child led video- The Egg in the Bottle Experiment (1:42) https://www.youtube.com/watch?v=tmc9U_mK3v4
- Good scientific explanation- Egg in a Bottle (3:05) <https://www.youtube.com/watch?v=28TlyWdfxxc>
- Older Students –Egg in the Bottle Experiment The Science Guys Combined Gas Law (5:21) <https://www.youtube.com/watch?v=kr1V0KtZPGw>
- The combined gas law (5:26) <http://study.com/academy/lesson/combined-gas-law-definition-formula-example.html>



- Kids video gas laws explained and defined Gas Laws for kids (4:09) <https://www.youtube.com/watch?v=E3uVygSvEFs>

Introduction- What is an egg?

- **Bring** a carton of eggs to the class. Have the students observe them.
- **Ask:**
 - What is an egg? (*Allow time for students to share everything they know first.*)
 - What are the parts of an egg? Why do you think there are different parts?
 - What is the purpose of the shell?
 - Where do eggs come from?
- **Teach** about the different parts of an egg and what their roles are.
 - Use the "Anatomy of an Egg" as a resource:
<https://www.exploratorium.edu/cooking/eggs/eggcomposition.html>
- Go on a **virtual field trip** to an egg farm: <http://www.aeb.org/educators/farm-to-table-virtual-field-trips>

Interesting Egg Fact #1: How to Test the Freshness of Eggs

- Place the egg in a bowl of water.
- If it lays on its side at the bottom, it is still quite fresh.
- If the egg stands upright on the bottom, it is still fine to eat, but should be eaten soon.
- If the egg floats to the top, it is past its prime, and not good for eating.

Peeling Eggs

- **Share:** In order to make Scientific Chef's Salad and to do our first Eggsperiment you will need to know how to peel a hard-boiled egg.
- **Read** the **Featured Culinary Skill- Peeling Eggs** in the Scientific Chef's Salad recipe guide.
- Use what you learned in Interesting Egg Fact #1 to check the freshness of your eggs. Use your oldest eggs to cook hard-boiled eggs.
- **Provide** each student with an egg to boil and peel. (Save this peeled egg for the Eggsperiments)



Interesting Egg Fact #2: How do you know if an egg is hard-boiled or not?

- Pretend you hard-boiled some eggs to take for snack later in the week but they got mixed up with the raw eggs in the carton. How can you tell which one you could take and enjoy with lunch and which one would go splat? The answer is to take your egg for a spin!
- Take a raw egg and a hard-boiled egg: Spin both eggs and see what you notice.
 - The raw egg will spin more slowly and it will wobble! This is because the raw egg is fluid inside and this fluid moves around while it spins.
 - The hard-boiled egg has no fluid, so it doesn't wobble.
 - Put your finger gently on the eggs to slow them spinning. When you take your finger away, the raw egg will continue to spin for a few more seconds, as the fluid inside is still moving. The hard-boiled egg will stop immediately.

The Egg in a Bottle Experiment

Younger Students

- Materials
 - Glass bottle with an opening slightly smaller than the egg
 - One peeled hardboiled egg per student
 - A little dish of water or tiny bit of vegetable oil
 - A twist of paper
 - A lighter or matches (adult supervision)
- Procedure
 1. Coat the inside edge of the bottle mouth with a little water or vegetable oil for lubrication.
 2. Dip the peeled hard-boiled egg in some water.
 3. Place the small end of the egg facing downwards in the mouth of the glass bottle. *(It should be slightly larger than the mouth of the bottle, so that it doesn't fit inside.)*
 4. Have an adult use a match to light the strip of paper on fire. Lift the egg off the bottle, drop the paper inside with the flame end down, and quickly replace the egg. Watch the egg wiggle a little in the mouth of the bottle, and then get sucked inside!
- Results -Why does the egg fit in the bottle?



- Air pressure! When you first set the egg on the bottle, the air pressure inside the bottle was equal to the air pressure outside the bottle, so nothing happened.
- When you dropped the burning paper into the bottle, it caused the air inside the bottle to heat up and expand rapidly. This expanding air pushed its way out around the egg; that's why you saw the egg vibrating.
- Once the fire consumed all the oxygen inside the bottle, the flame went out and the remaining air in the bottle cooled down. Cool air takes up less space, exerting less pressure inside the bottle. (The egg acted as a seal to keep outside air from getting in to fill the extra space.)
- The result was an unbalanced force! The force of the air pushing down on the egg from outside the bottle was greater than the force of the air pushing up from inside the bottle. This pushes the egg into the bottle!
- How do you get the egg out again?
 - Give students an opportunity to suggest answers.
 - Use air pressure to remove the egg! Increase the air pressure inside the bottle
 1. Turn the bottle upside down and tilt it until the small end of the egg is sitting in the mouth.
 2. Put your mouth over the bottle and blow, forcing more air into the bottle and raising the pressure inside.
 3. When you take your mouth away the egg should pop out!
- Video Demonstration
 - Egg in a Bottle (3:05) <https://www.youtube.com/watch?v=28TlyWdfxxc>

Older Students

This experiment is very much like the experiment for the younger students but takes a couple of twists and turns. It expands on the science of air pressure to include explanation of The Combined Gas Law.

If you do not have all the equipment necessary, older students can do the same experiment as the younger students and then watch the video of the second experiment.

Materials

- Glass bottle with an opening slightly smaller than the egg
- One peeled hardboiled egg per student
- A twist of paper



- A lighter or matches (adult supervision)
- An apron or lab coat
- Heat resistant gloves or tongs
- A pot of boiling water

Procedure

- Watch the video: The Science Guys Combined Gas Law (5:21)
<https://www.youtube.com/watch?v=kr1V0KtZPGw>

Understanding the Combined Gas Law

- The combined gas law (5:26) <http://study.com/academy/lesson/combined-gas-law-definition-formula-example.html>
- Gas Laws for kids (4:09) <https://www.youtube.com/watch?v=E3uVygSvEFs>

Egg Jokes

What day do eggs dislike the most?

Fry-day!

What did Snow White call her chicken?

Egg White.

How did the egg get up the mountain?

It scrambled up!

Why can't you tease egg whites?

Because they can't take a yolk!

How do comedians like their eggs?

Funny side up!

The Egg Drop

- Watch the video: How do you keep an egg from breaking? (4:40)
https://www.youtube.com/watch?v=7Wn0KS_eWVc
- Have students try out their own solutions to the Egg Drop Experiment.
 - **Ask:**
 - What are you going to try? Why?
 - How do you think that will keep the egg from cracking?
 - What materials do you think will help?

Extension Ideas



- More Egg Related Lessons for Preschool and Kindergarten <http://www.aeb.org/educators/lesson-plans-and-materials/114-educators/lesson-plans-materials/543-pre-k-and-kindergarten-lesson-plans>
- Create your own Eggsperiment

Kitchen Prep

- Read the title page together.
- Identify and gather ingredients and tools.
- Discuss kitchen safety. Specifically, stove top safety (Visit Raddishkids.com/pages/safety).

Prepare Scientific Chef's Salad

- Ask children to read or describe each step.
- After the eggs are boiled, try out Interesting Egg Fact #2. See if you can tell a boiled egg from a raw egg.
- Conduct you eggscellent experiment. How does cooking time affect a boiled egg?
- Give each child a turn peeling, cutting, and arranging salad items.
- When the Scientific Chef's Salad is ready, eat, taste and share!
- Perform the Egg in a Bottle Experiment for your friends and family. Do it like a magic trick ... How do you think I can get this egg to fit in this bottle?... After you are done be sure to explain to them the science that makes the magic work!
- Share some egg jokes!



Lesson 3: Chocolate Soufflé Cake and Whipping Whites

Activity time: 60 minutes

Learning Outcomes

- Students will describe the physical characteristics of an egg.
- Students will create an idea they can test (hypothesis) about how an egg white will react when beaten.
- Students will conduct an experiment to test their hypothesis.
- Students will learn that eggs are made up of proteins that change when you heat them, beat them, or mix them with other ingredients.
- Students will learn that egg whites can be whipped into soft, firm, and stiff peaks.
- Students will be exposed to the terms *denaturation* and *coagulation*.
- Students will be reminded about the importance of washing their hands after touching raw egg.
- In the **Featured Culinary Skill** students will learn **Separating Eggs**.
- Students will make Chocolate Soufflé Cake.

Materials

- Recipe guide and ingredients and tools listed within.
- The Anatomy of an Egg
<https://www.exploratorium.edu/cooking/eggs/eggcomposition.html>
- For the Whipping Whites Experiment:
 - Eggs at room temperature (3 per student)
 - Whisk
 - Water
 - Measuring cup
 - Glass or stainless steel bowls
 - Paper and pencil (or science notebook)
- (Optional) For demonstrating learning:
 - Poster Board, markers, etc.
 - Camera or video
 - Drama costumes, scarves, cardboard boxes etc.



Resources

- Anatomy of an egg
<https://www.exploratorium.edu/cooking/eggs/eggcomposition.html>
- Science of Eggs <https://www.exploratorium.edu/cooking/eggs/eggscience.html>
- Salmonella information
<http://tna.europarchive.org/20120419000433/http://www.food.gov.uk/multimedia/pdfs/publication/eggscaterers.pdf>
- Videos:
 - Whipping Egg Whites to Perfect Peaks (3:51)
<https://www.youtube.com/watch?v=zhuRyq7NrcA>
 - Science: The Magic of Meringue- Why Timing Matters When Whipping Egg Whites and Sugar (2:39) <https://www.youtube.com/watch?v=0fnWf5BvXac>

Science Experiment Adapted from:

- <https://youngscientistlab.com>

Introduction- Egg Parts & Egg Separation

- **Demonstrate** how to crack an egg. (Remind students about food safety and the importance of washing hands after touching raw egg.)
- Put the open shell on a plate and have students share their observations. Have them **identify** the parts of the egg:
 1. **Shell**- Outer, hard casing of an egg.
 2. **Egg White** also called **Albumen**- Slimy clear liquid inside the egg.
 3. **Yolk**- Center, yellow part of an egg.
 4. **Membrane**- The film inside the egg shell that allows air to enter the shell but keeps the liquid safe inside.
- Have students **draw** the egg that they see on the plate and label the parts.
- **Share:** There are other important parts of an egg that you can't see. Eggs consist of proteins that change when you heat them, beat them, or mix them with other ingredients. The way that these proteins uncurl and react to each other and other substances are what creates scrambles eggs, causes egg whites to foam, and makes a hard-boiled egg hard.
- **Read** the **Featured Culinary Skill- Separating Eggs**. Help students practice how to separate eggs. Reinforce the importance of getting no yolk in the whites!
- Have students wash their hands!



- **Share:** Raw eggs can contain salmonella bacteria. These bacteria can make you sick if they find their way into your stomach. All you need to do to keep from getting sick is to make sure that you wash and dry your hands after touching raw eggs and clean surfaces, sinks, dishes and utensils thoroughly after working with eggs.

Whipping Whites Experiment

- Materials
 - Eggs at room temperature (3 per student)
 - Whisk
 - Water
 - Measuring cup
 - Glass or stainless steel bowls (not plastic!)
 - Paper and pencil (science notebook)
- Procedure
 - Whipping Water
 - Provide students with a bowl, a cup of water and a whisk. If necessary, demonstrate how to use a whisk.
 - **Ask:** What do you think will happen if you pour the water into the bowl and try to mix it with a whisk? What is your hypothesis?
 - Have students **record** their answers. (Younger students can draw a picture or dictate their ideas.
 - Pour the water into the bowl and use the whisk to mix the water.
 - Have students **record** their observations or draw a picture.
 - **Share:** When mixing water, air bubbles will temporarily form, but there will be no other change in the liquid. This is because bubbles that form in water quickly pop. Water molecules are electrically attracted to each other so they won't spread out to form a bubble film unless you add something that lessens the attraction.
 - Whipping Egg Whites
 - Provide students with 3 room temperature eggs and 2 (*clean and dry*) glass or stainless steel bowls
 - Have students crack and **separate** their eggs.
 - Separate over one bowl and only pour the white into the mixing bowl if there is no yolk! Even a small amount of yolk or its residue can change this experiment, so be careful!



- Save the yolks for your breakfast tomorrow!
- Continue until you have three egg whites in one bowl.
- **Ask:**
 - What do you think will happen when you beat the egg white?
 - How will the egg white react?
 - Will it do the same thing the water did?
- Have students write a **hypothesis** for what they think will happen.
- Beat the eggs with a whisk.
 - Have students observe what happens.
 - Continue to whisk until the egg whites are white in color and hold stiff peaks. This takes some time so don't give up!
 - When egg whites are at the "stiff peaks" stage, you can turn the bowl upside down and they won't spill out!
- Have students record their **observations**.
 - **Ask:**
 - How did your observation compare to your hypothesis?
 - Can you come up with a scientific explanation for what you observed?
 - Why do you think the eggs formed foamy peaks?
 - Hint: Read the **Whipping Whites** section of the Chocolate Soufflé Cake recipe Guide.
- (Optional) Challenge students to create a visual representation of the science behind beating egg whites. It could be in the form of a poster, video, series of photographs, or even a dramatization of what happens.

The Science Explained - What happens when you beat an egg white

- Egg whites are about 90% water and 10% protein.
- Egg-white proteins are long chains of amino acids that fold and curl. When you beat an egg white, these proteins uncurl and stretch out. That's called *denaturation*. When the proteins uncurl, they expose their hidden amino acids. Some of those amino acids are attracted to water and others repel water.
- Whisking the egg whites also mixes air into them, causing the proteins to come out of their natural state.
- These *denatured* proteins gather together where the air and water meet and create multiple bonds with the other unraveled proteins, and thus become foam, holding the incorporated air in place. This process is called *coagulation*.



- When beating egg whites, they are classified in three stages according to the peaks they form: soft, firm, and stiff peaks.
- Egg whites will not form stiff peaks if they are exposed to any kind of fat, such as cooking oil or the fat contained in the egg yolk. The fat or bits of yolk keep the whites from accepting air.

Explore short videos that show the magic of egg whites at work:

- Whipping Egg Whites to Perfect Peaks (3:51)
<https://www.youtube.com/watch?v=zhuRyq7NrcA>
- Science: The Magic of Meringue- Why Timing Matters When Whipping Egg Whites and Sugar (2:39) <https://www.youtube.com/watch?v=0fnWf5BvXac>

Extension Ideas

- Try the above experiment using a plastic bowl vs. glass, cold eggs vs. room temperature eggs, whites with a little bit of yolk mixed in vs. none at all.
- Try whipping egg whites to the three different stages of soft, firm or stiff peaks.
- Try adding sugar at different stages of making a meringue and see what results you get.

Kitchen Prep

- Read the title page together.
- Identify and gather ingredients and tools.
- Discuss kitchen safety, especially oven safety (Visit Raddishkids.com/pages/safety).

Prepare Chocolate Soufflé Cake

- Ask children to read or describe each step.
- Give each child a turn separating, whipping and folding egg whites.
- Optional- While the cake is baking have the students display/rehearse their visual representation that explains the science behind beating egg whites.
- Once the Chocolate Soufflé Cake is ready, gather your family and friends together to Eat, Taste and Share!
- While everyone is enjoying their Chocolate Soufflé Cake, have students explain how the science of egg whites affect the height of the cake they are enjoying.

Experiment 1 - Procedure and Worksheet

"Magnetic Cornflakes"

Materials

Cornflakes

A bowl

Water

Magnet

(Optional) other kinds of cereal

Question:

How will a corn flake react to a magnet?

Hypothesis:

What do you think will happen? Write a sentence and draw a picture.

Procedure:

1. Fill a bowl with water.
2. Take ONE cornflake and sit it on the surface of the water in the middle of the bowl. *Don't let the cornflake get too close to the edge of the bowl or it will get stuck!*
3. Move the magnet close to the cornflake. *Do not allow the magnet to touch the cornflake or the water.*
4. Move the magnet around and see what happens.

Observations:

Write and draw what happened during the experiment.

Conclusion:

Was your hypothesis correct?

The Science Explained

When you move the magnet around the bowl, the cornflake should follow the magnet. Why? Cornflakes are magnetic because they contain a significant amount of iron, a magnetic material. Standard cornflakes contain around 8 milligrams of iron per 100 grams (so 0.008% of the weight of a cornflake is iron). This is enough to cause a floating cornflake to move when it is near a magnet.

Optional- Cereal Comparison

- Repeat the experiment using different cereals and see what happens.
- Create a table to compare the reactions of different cereals.

Sample for Younger Students

Type of Cereal (draw a picture)	Did the magnet make it move?	How did it move compared to Corn Flakes? (More, less, faster, slower, straighter etc.)

Sample for Older Students

Cereal	Did the magnet make it move?	How did it move compared to corn flakes? (More, less, faster, slower, straighter)	Iron % from Nutrition Panel	Difference in Iron % between cornflakes & new cereal

Experiment 2 - Procedure and Worksheet

"Iron Extraction from Corn Flakes"

Materials

2 cups corn flakes

Resealable plastic bag

Rolling pin

Measuring Cup

Warm water

Magnet (*a super strong Neodymium Magnet works best- can be found on Amazon.com*)

Optional

Other types of cereal for comparison

Duct Tape

Question:

Can we extract the iron from corn flakes using a magnet?

Hypothesis:

What do you think will happen? Write a sentence and draw a picture.

Procedure:

1. Take the plastic bag and add a handful of corn flakes.
2. Close the bag and crush the corn flakes using a rolling pin.
3. Fill the bag 2/3 full with warm water and seal the bag. (Measure how much water you added so that you can keep the amount constant for comparison with other kinds of cereal.)
4. Leave the bag for a while to make sure the corn flakes are really soft – about 15mins or so.

5. Hold the magnet up to the outside of the bag and move the magnet all over the surface but keep it in contact with the plastic (you can swirl the contents of the bag at the same time to help this!) Optionally, you can pour the contents of the bag into a bowl and leave the magnet in there for a few minutes.
6. Look very carefully at where the magnet meets the bag and note what you see.

Observations:

Write and draw what happened during the experiment.

Conclusion:

Was your hypothesis correct?

The Science Explained

- You should see very small flecks of grey in the bag where the magnet touches. These are pieces of iron!
- Cereal companies add actual iron/metal to the cereal because iron in other forms reduces the shelf life of cereal (makes it stay fresh for less time in the store). The acid in your stomach is strong enough to dissolve these tiny bits of metal and release the elemental iron into your system.
- Cereal companies *fortify* cereal with iron because it's an essential nutrient for your body. We need iron to transport oxygen from the lungs to the rest of the body. Iron is important in the formation of hemoglobin, which is the part of your red blood cells that carries oxygen throughout the body.

Optional - Cereal Comparison

Repeat the extraction process with other kinds of cereal. Which kind of cereal has the most iron? Record your results.