

Photo Description



This image shows a kitchen science setup with dry ingredients (like cinnamon and sugar) in a white bowl with a whisk, and a red liquid (likely food coloring or tomato sauce) being mixed in a KitchenAid mixer. These are everyday examples of combining materials to create mixtures—a fundamental concept in understanding how substances can be put together while keeping their basic properties.

Scientific Phenomena

Anchoring Phenomenon: Creating mixtures by combining dry and liquid ingredients.

When dry materials (like cinnamon and sugar) are combined with liquids (like food coloring or sauce), the particles of each substance become distributed throughout the other. This is a physical change because no new substance is created—the ingredients can still be separated if needed. The visible color change and texture change are observable signs that mixing has occurred, but the sugar is still sugar and the cinnamon is still cinnamon; they're simply combined together in a new arrangement.

Core Science Concepts

- * Mixtures: A combination of two or more materials that are physically blended together but keep their individual properties. Each ingredient in a mixture maintains its own characteristics.
- * Physical Changes: Changes in the appearance or form of a material that do NOT create a new substance. Mixing is a physical change because the original materials can be separated again.
- * Particle Model: All matter is made of tiny particles. When we mix ingredients, we're distributing these particles throughout another material, creating a more uniform combination.
- * Observable Properties: We can describe and measure the appearance, texture, color, and consistency of mixtures. These observations help us understand what happens when materials combine.

Pedagogical Tip:

Use the familiar context of cooking or baking to anchor this lesson. Students already have intuitive knowledge about mixing ingredients—leverage this prior experience to make abstract particle concepts concrete and relatable. Have students predict what will happen before mixing to build scientific thinking habits.

UDL Suggestions:

Provide multiple means of engagement by offering choice: students can mix liquids and solids, solids and solids, or liquids and liquids. Offer visual demonstrations alongside tactile experiences. Allow students to record observations through drawings, words, or videos to honor different learning preferences and communication styles.

Zoom In / Zoom Out

Zoom In: Microscopic Level

When we zoom in super close—so small that we'd need a powerful microscope to see—we'd discover that the cinnamon and sugar are made of billions of tiny particles called molecules. When you mix them together, the cinnamon particles spread out and nestle between the sugar particles. Each tiny particle stays exactly what it was (cinnamon is still cinnamon at the particle level), but now they're jumbled together instead of separated. The red food coloring works the same way: its molecules scatter throughout the white mixture, spreading evenly as they bump into other particles. This random movement of particles is happening constantly, even when we can't see it!

Zoom Out: Kitchen and Food Systems

When we zoom out to see the bigger picture, mixing ingredients is a crucial part of how our food system works. Every recipe you follow—whether it's cookies, soup, or salad dressing—relies on combining ingredients to create new foods with different textures and flavors. Food scientists and chefs use their understanding of mixtures to invent new products we eat every day. On an even larger scale, food mixing happens in factories where thousands of pounds of ingredients are combined to make packaged foods for grocery stores across the country and around the world. Understanding how mixtures work helps us appreciate the science behind every meal!

Discussion Questions

1. "If you mixed salt into water until you couldn't see the salt anymore, do you think the salt is still there? How could you prove it?"

(Bloom's: Analyze | DOK: 3)

2. "What do you notice about how the red liquid spreads through the bowl? Why might that happen if we think about tiny invisible particles?"

(Bloom's: Evaluate | DOK: 2)

3. "Compare mixing cinnamon into sugar with mixing paint colors together. How are they the same? How are they different?"

(Bloom's: Compare | DOK: 3)

4. "If we separated all the cinnamon particles back out of the mixture, would we still have the same amount of cinnamon we started with?"

(Bloom's: Understand | DOK: 2)

Potential Student Misconceptions

Misconception 1: "When I mix things together, I'm making something completely new that can never be separated."

Clarification: When you mix ingredients, you're creating a physical change, not a chemical one. The original materials are still there—they're just rearranged! Think of it like mixing red and blue LEGO bricks: you've created a new pattern, but the red bricks are still red and the blue bricks are still blue. You could pick them apart and separate them again. The same is true with sugar and cinnamon—they blend together, but each material keeps its own identity.

Misconception 2: "If I can't see something anymore (like salt in salt water), it has disappeared and doesn't exist anymore."

Clarification: Just because we can't see something doesn't mean it's gone! The salt particles are still there in the water—they're just too small and spread out for our eyes to see. We could prove the salt is still there by letting the water evaporate; the salt crystals would be left behind. Invisible doesn't mean gone; it just means our eyes need help to detect it.

Misconception 3: "All mixtures look the same after mixing—you can't tell what's in them anymore."

Clarification: Some mixtures look uniform and blended (like food coloring mixed into water), but many mixtures still show their separate parts! Trail mix shows all its ingredients mixed together. Oil and water create layers instead of blending. Even when ingredients mix thoroughly, we can often identify them by their properties: we can taste salt in salt water, see different colored candies in a mixed bowl, or smell vanilla in vanilla-sugar mixture. The ingredients don't disappear just because they're mixed!

Extension Activities

Activity 1: Mixtures vs. Solutions Investigation

Have students create different types of mixtures: sand and water (mixture that separates), salt and water (solution where salt dissolves), and oil and water (mixture that separates). Students predict whether each mixture will separate and test by letting them sit overnight. This deepens understanding that not all mixtures behave the same way.

Activity 2: Reversible Changes Exploration

Using safe, food-grade materials, challenge students to create a mixture, then reverse it. For example, mix cocoa powder into water, then use a filter to separate the cocoa. Discuss: "Can we always separate a mixture back into its original parts?" This connects to the reversibility of physical changes.

Activity 3: Kitchen Chemistry Hunt

Have students identify 5-7 mixtures in their kitchen at home (trail mix, salad dressing, cereal and milk, seasoning blends, etc.). They photograph or sketch each one and label the individual materials they can see. Share findings in class to show that mixtures are everywhere in everyday life.

Cross-Curricular Ideas

Mathematics Connection: Measuring and Ratios

Have students create different mixtures using specific ratios. For example, mix 2 cups of flour with 1 cup of sugar, or 3 tablespoons of red food coloring with 1 cup of water. Students can predict how the ratio affects the final mixture (stronger color with more coloring, sweeter taste with more sugar) and then test their predictions. This connects to understanding ratios and proportional reasoning in a hands-on, observable way.

Language Arts Connection: Procedural Writing and Recipe Creation

Ask students to write clear, step-by-step instructions for creating a specific mixture (like a spice blend, trail mix, or colored water). They must use precise vocabulary (combine, blend, distribute, stir, measure) and sequential language (first, next, then, finally). Students can then exchange recipes with a classmate and follow the instructions exactly to see if they get the same result. This reinforces that clear communication is important in science!

Art Connection: Color Mixing and Visual Exploration

Have students explore how different colors mix together to create new colors using food coloring in water or paint. They can create a color-mixing chart showing primary colors, secondary colors, and tertiary colors. Connect this to the particle concept: when red and yellow food coloring particles mix, they distribute evenly and create the visual appearance of orange, even though the individual colored particles are still there. Students can display their color charts and explain the science behind the color changes they observe.

Social Studies Connection: Food Culture and Global Mixtures

Research spice blends and food mixtures from different cultures around the world. For example, garam masala (Indian spice blend), za'atar (Middle Eastern blend), or Chinese five-spice powder are all carefully designed mixtures. Students can learn about where these ingredients come from and why different cultures mix ingredients in specific ways. This connects science to geography, history, and cultural appreciation while showing that mixture science is used intentionally in real life.

STEM Career Connection

Food Scientist

Food scientists are like detective-chefs who figure out how to make food taste better, last longer, and be healthier. They spend their days mixing ingredients, testing how different mixtures behave, and inventing new food products. For example, a food scientist might experiment with mixing different fruits, sugar, and water in just the right ratios to create the perfect jam or smoothie flavor. They use their understanding of how substances combine to create foods we enjoy every day. Food scientists work in factories, research labs, and companies like General Mills or Coca-Cola. Average annual salary: \$67,000

Chef or Recipe Developer

A chef or recipe developer creates new dishes and mixtures that taste amazing by understanding how different ingredients interact when combined. They decide exactly how much cinnamon, sugar, and other spices to mix together to create the perfect flavor. Professional chefs in restaurants and recipe developers for cooking shows or cookbooks use science every time they mix ingredients—they know that certain ratios create specific tastes and textures. They test their mixtures again and again until they get them just right. Average annual salary: \$52,000

Chemist

Chemists study how substances mix and combine. While some chemists work with dangerous chemicals in labs, others work on exciting projects like creating new medicines, improving materials, or understanding how mixing and chemical reactions work. A chemist might study why oil and water don't mix, or design a new cosmetic product by carefully blending ingredients. They use their understanding of particles and how they behave when combined to solve real-world problems. Average annual salary: \$78,000

NGSS Connections

Performance Expectation:

5-PS1-1: Develop a model to describe that matter is made of particles too small to be seen and that these particles are in constant motion.

Disciplinary Core Ideas:

- * 5-PS1.A Properties of Matter—Matter of any type can be subdivided into particles that are too small to be seen, but the matter still exists and can be detected by other means.
- * 5-PS1.B Chemical Reactions—When two or more different substances are mixed, a new substance with different properties may be formed; physical mixing of materials results in different properties than either original material.

Crosscutting Concepts:

- * Patterns - Observable patterns in mixtures help us predict what will happen when we combine different materials
- * Structure and Function - The properties of the individual materials determine how they behave when mixed

Science Vocabulary

* Mixture: A combination of two or more materials mixed together that keeps the properties of each original material.

* Physical Change: A change in how something looks or feels, but the material stays the same kind of matter.

- * Particle: A tiny, tiny piece of matter so small we cannot see it without special tools.
- * Distribute: To spread something out evenly across an area or throughout another material.
- * Substance: A specific type of matter with its own particular properties, like salt, sugar, or water.

External Resources

Children's Books:

Mixing Colors* by Rebecca Olien (Simple Sight Word Books) - Explores how colors mix together
What Is a Mixture?* by Jennifer Boothroyd (Lerner Publishing) - Directly addresses the concept with age-appropriate photos
The Magic School Bus Goes Microscopic* by Joanna Cole - Explores the particle nature of matter in an engaging narrative