
Name

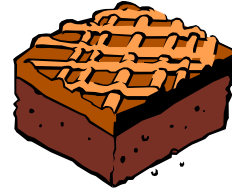
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BROWNIES for SCIENCE!

Did you know that making brownies is science? How is that possible? It's all a matter of matter, mixtures and chemistry! Making brownies can also help us understand how important ingredients are to a process and how individual components to a mixture relate to the mixture. Today, we will make and share brownies to explore matter and mixtures, learn about learning, and introduce the scientific method, all fundamental tools for science class.

"Lou's Brownies" (my grandmother's recipe for brownies):



The recipe, below, makes one 8" x 8" pan of brownies:

Review each ingredient's characteristics that contribute to a successful brownie recipe:

- **Sugar** is a sweetener necessary to balance the bitterness of the cocoa powder. (1 C)
- **Flour** has gluten (sticky when wetted) and fiber to provide volume, body and texture to food items. (1/2 C)
- **Cocoa powder** is defatted cocoa, which when sweetened and reconstituted with butter, makes chocolate. (4 Tb)
- **Egg** is an animal product from birds (chickens in this instance) that is rich in fats and proteins and when heated cross-links to bind other ingredients together. (2 each)
- **Butter** is an aerated fat from milk, which helps combine ingredients that are not soluble in water. (1/4 C)
- **Heat (325°F, 25 minutes)**

1. Predict what happens if you eliminate (leave out) the flour.

2. Predict what happens if you eliminate the sugar.

3. Predict what happens if you eliminate the cocoa powder.

4. Predict what happens if you eliminate the butter.

5. Predict what happens if you eliminate the eggs.

6. Predict what happens if you eliminate the heat energy.

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Now, carefully examine the prepared samples of each of the six versions of the **Lou's Brownies** in which one ingredient (variable) was eliminated. Which ingredient could we eliminate (leave out) from the recipe and still have delicious brownies? Explain your reasoning.

Use the table below to make an analogy for each of the **Brownie Ingredients**. Connect each of the ingredients in the recipe to what you feel they represent as the various **Science Class Tasks** we will perform throughout the year and the **Descriptors and Actions** that each ingredient brings to mind to you. Use complete sentences as you describe each ingredient. You may group ingredients, science class tasks and/or descriptors and actions any way you wish when constructing your analogies.

<u>Brownie Ingredients</u>	<u>Science Class Tasks</u>	<u>Descriptors and Actions</u>
Flour	reading	fun
Sugar	thinking	bind (hold together)
Cocoa powder	laboratories	activate (set in motion; turn on)
Butter	projects	react
Eggs	assessments (tests and quizzes)	flavorful
heat energy (325° F for 15 minutes)	writing Tasks	sweet
		connect

Use the lines below to write your analogies.

An illustration showing two hands, one green and one purple, holding several brownies on a blue plate. There are also some brownies on the table in front of the plate.

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If we left out more than one ingredient at a time, what could we conclude about the importance of each one? Explain your reasoning.

What **science class tasks** did you use today as we made our **Brownies for Science**? Provide examples.

Which **science class task(s)** can we eliminate from our learning experience and still learn science? Explain your reasoning.

Let's examine one characteristic of the mixture, uncooked brownies, and each of its components - **mass**. When cooking, most ingredients are measured by volume. We will focus on mass, the amount of a substance available, rather than the space it occupies. To do this, we will first need to measure the ingredient by volume and then use a balance to determine its mass. This process involves a bit of math.

1. We must know the mass of the empty measuring container, which is called "tare" mass.
2. We then fill the measuring device with the ingredient and determine the mass of the container and the ingredient. This mass is our "gross" mass.
3. To determine the actual mass of the ingredient, we will need to subtract the tare mass (container only) from the gross mass (container plus the ingredient).

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Sugar	Egg
Gross _____	Gross _____
Tare — _____	Tare — _____
Net _____	Net _____
Flour	Butter
Gross _____	Gross _____
Tare — _____	Tare — _____
Net _____	Net _____
Cocoa Powder	Mixture
Gross _____	Gross _____
Tare — _____	Tare — _____
Net _____	Net _____

Based on what you know about the mass of each individual ingredient, predict the mass (in grams) of the mixture, all ingredients combined:

Explain your reasoning:

We will now combine the ingredients and measure the actual mass of our brownie mixture. How does the mass you predicted above compare with the mass we measured? Explain your observation(s).

