



It's Baking!

Science

Once upon a time, long, long ago, there was a house made of gingerbread, children made of cookies, and a witch... Hey! This must be make-believe. Bring on the real "dough."

National Standards > Science

NS.K-4.2, NS.5-8.2 Physical Science (Grade 4) (Grades 5 & 6)

- Properties of objects and materials
- Properties and changes of properties in matter

Kentucky: Science > Physical Science

2. Students shall develop their abilities to apply core concepts and principles from mathematics, the sciences, the arts, the humanities, social studies, practical living studies, and vocational studies to what they will encounter throughout their lives.

Properties of Objects and Materials (2.2 Patterns of Change, 2.3 Systems, 2.4 Scale and Models, 2.5 Constancy, and 2.6 Change Over Time)

2.6 Students understand how living and nonliving things change over time and the factors that influence the changes.

(Grade 4)

SC-E-1.1.1 Objects have many observable properties such as size, mass, shape, color, temperature, magnetism, and the ability to react with other substances. Some properties can be measured using tools such as metric rulers, balances, and thermometers.

(Grades 5 and 6)

SC-M-1.1.1 A substance has characteristic physical properties (e.g., density, boiling point, solubility) that are independent of the amount of the sample. A mixture of substances often can be separated into the original substances by using one or more of these characteristic physical properties.

SC-M-1.1.2 The chemical properties of a substance cause it to react in predictable ways with other substances to form compounds with different characteristic properties. In chemical reactions, the total mass is conserved. Substances are often classified into groups if they react in similar ways.

Ohio: Science > Science > Physical Sciences

- Demonstrate an understanding of the composition of physical systems and the concepts and principles that describe and predict physical interactions and events in the natural world.
- Demonstrate an understanding of the structure and properties of matter, the properties of materials and objects, chemical reactions and the conservation of matter.

- Understand the nature, transfer and conservation of energy, as well as motion and forces affecting motion, the nature of waves and interaction of matter and energy.
- Demonstrate an understanding of the historical perspectives, scientific approaches and emerging scientific issues associated with the physical sciences.

Benchmark(s) Grade 4

A. Compare the characteristics of simple physical and chemical changes.

Benchmark(s) Grade 6

A. Relate uses, properties and chemical processes to the behavior and/or arrangement of the small particles that compose matter.

Note: Emphasis for Grade 5 is on the production and transfer of energy.

Objective

Students will:

- Examine change in the physical and chemical properties when baking dough.
- Examine how varying amounts of a substance may effect needed cooking time.

Assessment

Student will be able to:

- Identify physical attributes of a given substance.
- Measure mass of a substance
- Compare the physical properties of a substance before and after a chemical change
- Gather and communicate information from observations and investigations.

Sample Items to gauge student understanding:

1. Which of the following is an example of a physical change?
 - a. The witch disappears into the oven.
 - b. Hansel breaks off a piece of the gingerbread house. *(b)*
 - c. Gretel eats and digests part of the gingerbread house.
2. Choose an object in the classroom. Write down the name of the object and list two of its physical properties.
 - a. Object: _____
 - b. Physical property #1: _____
 - c. Physical property #2: _____
3. Predict what changes will occur if you left a small bowl, medium sized bowl and large bowl of ice cream sitting on a picnic table out in the sun on a hot summer day. Include what the changes might be and how they would differ in each bowl. *(melting will occur, perhaps at different rates)*

Vocabulary

- Mass
- Data
- Physical properties
- Chemical change
- Variable
- Constant

Materials

- Dough (gingerbread dough or any pre-made cookie or biscuit dough is doable)
- Spoons
- Cookie sheets
- Balance/Food Scale
- Oven mitt
- Spatula
- Timer
- Toaster oven, or access to an oven
- Observation sheet
- Handout: "Witch" Cooks Fastest?

Activity 1

"Witch" Will Bake First?

Teacher will:

1. Prepare/buy dough before implementing activity.
2. Facilitate student reflection and discussion of the events in the story and production, Hansel and Gretel, with emphasis on the scene involving the witch's efforts to have Gretel climb into the oven, but instead falling in herself due to Gretel's trickery.
Question prompt: If the witch and the children were put into the oven at the same time, which one would have baked and turned into a cookie first?
3. Allow students to discuss and share their answers with the requirement to provide rationale as to why or why not there be a difference. (Key emphasis is the factor of size and amount of the object baked.)
4. Explain to students their task of baking dough. (*Explain that they are not to eat anything they will use for the experiment.*)
5. Introduce/review with students the concept of physical properties.
6. Distribute dough of equal mass (amounts) to student groups.
7. Have students observe and list on an observation sheet the physical properties of their dough.
8. Have students divide the dough into three different sized amounts and find and record the mass of each using a balance or food scale.

9. Have students roll each amount of dough into a ball and place it on a cookie sheet. *(If more than one group's dough is placed on a cookie sheet, labeling is beneficial.)*
10. Bake the dough with use of a set timer. *(The three different amounts of dough are baked for the same amount of time. The variable in the experiment is the size of the amount of dough. Check directions on package or recipe for cooking times.)*
11. Facilitate class discussion while the dough is cooking to address the constants and variables of the experiment, emphasizing that any good experiment only has a single variable.
12. Remove dough from oven and allow to cool, and then return dough to students for further observations.
13. Facilitate class discussion for students to share observations and examine what happened to the dough during baking. Question prompts;
 - a. Did the three different amounts of dough bake evenly in the same amount of time? If not, what happened?
 - b. Did size of the dough amounts appear to be a factor in the baking of the dough?
 - c. Can you now answer the previous question with more authority that if the witch and the children were put into the oven at the same time, which one would have baked and turned into a cookie first?

Students will:

1. Actively participate in class discussions and questionings.
2. Write down physical properties for a substance of dough, including its mass.
3. Divide dough into three noticeably different sized amounts baking.
4. Observe, compare and contrast the dough balls after baking, and record changes in physical properties of each amount.
5. Formulate inferences and conclusions for experimentation with baking.



Handout: Science (4-6)
"Witch" Cooks Fastest?

Name: _____ Date: _____

Directions:

List the physical properties of the provided dough for your observation.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Before cooking:

Record the mass of each ball of dough in the box with the appropriate label. *(Remember to include the unit used to measure the mass)*

Small

Medium

Large

After cooking:

Record the mass of each ball of dough in the box with the appropriate label. *(Remember to include the unit used to measure the mass)*

Small

Medium

Large

Describe the **small** dough ball's physical properties after cooking:

Describe the **medium** dough ball's physical properties after cooking:

Describe the **large** dough ball's physical properties after cooking:

Circle the dough ball size that cooked fastest? Small Medium Large

Based on the above findings from your observations, answer the following question.

Assuming that the witch is larger and has more mass than Hansel and Gretel, and of the three, Gretel has the least amount of mass, which of the characters would turn into a cookie the fastest? Write your conclusion to share with the class. Include the reasons that led to this conclusion.
