TEACHING SCIENCE
...when you don't know diddly-squat

How do you make the best chocolate chip cookie?

Purpose:

The purpose is **not** to teach specific content, but to teach the process of science – asking questions and discovering answers. This activity encourages young people to try to figure things out for themselves rather than just read an answer on the internet or in a book. As a leader, try not to express your opinion, but let the youth engage in arguments based on evidence.

Time required:

20 minutes or more depending on the interest and questions the youth have

Materials:

- ❏ Chocolate chip cookies (See #2)
- ❏ Pencil
- ❏ Paper
- ❏ Plates
- ❏ Napkins
- ❏ Milk (optional)

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SCIENCE PRACTICE:
Asking questions and defining problems

1. *Do you think there is a "perfect" chocolate chip cookie? What makes a good cookie? Do you like cookies chewy or crispy? What might affect the flavor and texture of a cookie?*

SCIENCE PRACTICE:
Planning and carrying out investigations

2. Have people coming to your meeting make different versions of the following recipe. One person needs to make the "control" or standard recipe. Everyone else does a slight variation. You can use the variations listed or make up your own.

Standard Recipe for Chocolate Chip Cookies (Control)

1 cup (2 sticks) butter, softened
3/4 cup granulated sugar
3/4 cup packed brown sugar
2 large eggs
1 teaspoon vanilla extract
2 1/4 cups all-purpose flour
1 teaspoon baking soda
1 teaspoon salt
2 cups (12-oz. pkg.) chocolate chips

Preheat oven to 350 °F.

In a bowl, cream butter and sugars. Add eggs and vanilla, and beat until mixed.

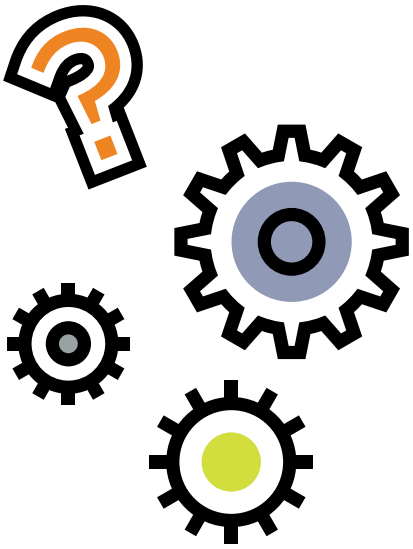
In a separate bowl, whisk together flour, baking soda and salt. Add flour mixture to other ingredients and mix.

Add chocolate chips and mix again.

Put a dozen cookies each on two half-sheet pans. Bake for 10 minutes, turning trays around and switching racks halfway through baking.

Remove from oven and let cool.

You do not need all the answers to teach science. You simply need an inquisitive mind and to be willing to carry out an investigation.



Potential Variations (use some or all):

Use all white sugar.
Use all brown sugar.
Use honey instead of the sugar.
Use molasses instead of the sugar.
Use maple syrup instead of the sugar.
Use corn syrup instead of the sugar.
Use shortening or margarine instead of butter.
Use lard instead of butter.
Use oil instead of butter.
Melt the butter.
Use baking powder instead of baking soda.
Use four eggs instead of two.
Use duck or other eggs instead of chicken eggs.
Use whole wheat flour instead of all-purpose flour.
Use cake flour instead of all-purpose flour.
Use nonwheat flour (such as rice, oat, barley, garbanzo, millet, cricket) instead of all-purpose flour.
Let the dough rest in the refrigerator for at least 4 hours before baking.

Have participants make their cookies and bring them to the meeting. Make name tents describing each variety. Have participants vote for their favorite cookie. You may wish to track adults and youth separately.

SCIENCE PRACTICE:
Using mathematics and computational thinking

3. Create a chart with the cookie types and record how many votes each received. See the following for an example:

Cookie Variations and Votes

Cookie variations (examples)	Total votes	Youth votes (optional)	Adult votes (optional)	Notes
Control				
Extra eggs				
Oil				
Rested dough				

SCIENCE PRACTICE:
Analyzing and interpreting data

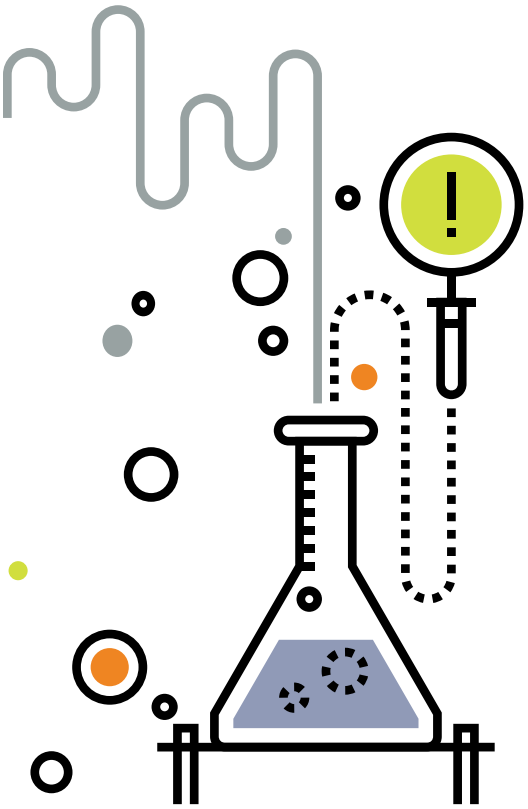
4. Convert your data to a bar graph or a pie chart. *Are there certain variations that people like better than others? Was texture more important or flavor? Were there differences in what youth and adults liked?*

SCIENCE PRACTICE:
Engaging in argument from evidence

5. *If you were the owner of a bakery, what kind(s) of cookies would you make? Why? Would you make one type or several types? If you were a baker, how do you think the cost of materials or time it took to make the cookies would factor into your decision?*

SCIENCE PRACTICE:
Obtaining, evaluating, and communicating information

6. *What words would you use to describe your cookie? How might you promote a particular cookie over another?*



Other thoughts:

- *Are there other baked goods you could test this way? What about pies or pie crust? Bread (you could test bread made by machine versus made by hand)? Brownies? Banana bread? Muffins?*
- *Did certain types of cookies hold together better when dunked in milk? Why or why not?*
- *Can you have too many chocolate chips in a chocolate chip cookie?* (You could try making the control recipe with different amounts of chocolate chips and see what people prefer.)
- *Does sifting the dry ingredients make a difference?*

Science & Engineering Practices:

These eight Science and Engineering Practices come from *A Framework for K–12 Science Education* (National Research Council, 2012, p. 42). These research-based best practices for engaging youth in science are connected to in-school science standards that all children must meet.

- Asking questions and defining problems
- Developing and using models
- Planning and carrying out investigations
- Analyzing and interpreting data
- Using mathematics and computational thinking
- Constructing explanations and designing solutions
- Engaging in argument from evidence
- Obtaining, evaluating, and communicating information

Reference:

National Research Council. (2012). *A framework for K-12 science education: Practices, crosscutting concepts, and core ideas*. Washington, DC: National Academies Press

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