Cookie Chemistry

2nd Grade

Testable Question: 5 pts - How does a chocolate chip cookie recipe affect the cookie's taste?

Prediction: 5 pts - I think that changing the recipe won't affect the taste of the cookie because we are only changing one thing, so it won't make a big difference.

Procedure: 5pts

1. Make a batch of chocolate chip cookies using the following recipe: ½ cup of all purpose flour, ¼ teaspoon of baking soda, ¼ teaspoon of iodized salt, ¼ cup softened salted butter, ¼ cup white granulated sugar, ¼ cup packed light brown sugar, ¼ teaspoon vanilla extract, ½ large egg, ½ cup semisweet chocolate chips. Mix the flour, baking soda, and salt in a small mixing bowl. Using a standing mixer, beat the granulated sugar, brown sugar, butter, and vanilla on level 4 for 1 minute. Then, add the egg. Next, add the flour mixture a little at a time. Finally add the chocolate chips and stir for 1 minute. Use a cookie scoop to make uniform-shape and size cookie balls and place them on a baking sheet lined with parchment paper. Bake them at 375℉ for exactly 9 minutes in a standard oven on the middle rack. After baking, place the cookies on a cooling rack until cooled to room temperature. Call this “batch A”.
2. Make another batch of cookies just like the first, but with melted butter instead of softened butter. Call this “batch B”.
3. Make another batch of cookies just like the first, but with rice flour instead of all purpose flour. Call this “batch C”.
4. Make another batch of cookies just like the first, but with baking powder instead of baking soda. Call this “batch D”.
5. Make another batch of cookies just like the first, but mix all the ingredients without “creaming” the sugar, butter, and vanilla first. Call this “batch E”.
6. Measure the diameter of each cookie and record this data.
7. Hold a blind taste test with members of my family and record this data.

Background: 5 pts

I chose this project because…

I wanted to figure out how to make the best chocolate chip cookies.

In my research I found out that…

Recipe A (the original, classic recipe) was the favorite in the blind taste test. Changing the recipe can change the taste of the food. I didn't expect the recipes to affect the taste of the cookie because we only changed one ingredient at a time. But it actually made a difference!

This project is important because...

I want to make the best chocolate chip cookies when we have guests. And I learned that when you're following a recipe, you have to be precise or else you might ruin it. You also might make a recipe even better by changing it.

Constant Conditions: 10 pts

Independent Variable: The ONE thing you change

We changed one part of the recipe at a time. First, we made a control group batch of cookies using a recipe we got off the back of a chocolate chip bag. We noticed that the recipe said to use softened butter. So, in our first experimental group, we melted the butter. In the next experimental group, we used rice flour instead of all-purpose flour. In the next group, we used baking powder instead of baking soda. We noticed the original recipe said to “cream” the sugar, butter, and vanilla together, so in the final group, we just skipped that step and just mixed everything together.

Dependent Variable: What you are measuring or observing

We measured the diameter of each cookie in centimeters. We observed the color, texture, and flavor of each type of cookie. We did a blind taste test to see which cookie tasted the best.

Constant Conditions: What you are keeping the same every time

Amount of each ingredient, constant baking temperature (190.6 ℃ or 375℉), same amount of time in the oven (9 minutes), same baking sheet, same scoop when measuring out cookie dough balls, used a blindfold for the taste test and used a ranking system for the taste test.

Data and Trials: 15 pts & 5 pts

Cookie Size by Recipe:

	Diameter of cookies (cm)										
Cookie:	1	2	3	4	5	6	7	8	9	10	Average
Batch A Original recipe	6.1	6.0	5.5	5.8	6.2	6.0	6.0	6.0	6.4	5.5	5.95
Batch B Melted butter	6.9	6.6	6.5	7.0	6.8	6.8	6.8	6.6	7	6.8	6.78
Batch C Rice flour	8.5	7.8	8.8	8.9	8.5	8.0	9.0	8.5	8.5	7.5	8.40
Batch D Baking powder instead of baking soda	5.3	5.5	5.4	5.5	5.2	5.0	5.9	5.7	5.7	5.3	5.45
Batch E Mixed ingredients without “creaming” the sugar, vanilla, and butter first	6.6	6.5	6.0	7.0	6.9	6.8	5.8	6.4	6.3	6.9	6.52

Blind Taste Test Results

	Taste Testers' Comments about Color (after blindfold removed)	Taste Testers' Comments about Texture (while blindfolded)	Taste Testers' Comments about Taste (while blindfolded)	Average overall score by taste testers (1-5; 1 = didn't like, 5 = liked a lot)
Batch A Original recipe	Pale, golden at edge and on bottom	Smooth texture, gooey in the middle, small crunch on the outside and at edges	Rich, chocolatey, buttery, sweet	4.5
Batch B Melted butter	Golden brown, even color edge to edge	Gooey, similar to Batch A but a little more crunch on the outside	Similar to A, but saltier	4.33
Batch C Rice flour	Golden brown in the middle, darker at the edges	Grainy/sandy, chewy, flat	Moist, sweet, rich, melted chocolate	3.33
Batch D Baking powder instead of baking soda	Pale edge to edge	Doughier, thicker, not as gooey in the middle	Salty, bland	3
Batch E Mixed ingredients without "creaming" the sugar, vanilla, and butter first	Golden brown edge to edge	Edges not as crispy, more like a pancake	"Missing flavor", not as sweet	3.5

Original Recipe (Control Group) - Batch A

Straight out of the oven

After cooling

Melted Butter - Batch B

Straight out of the oven

After cooling

Rice flour - Batch C

Straight out of the oven

After cooling

Baking powder instead of baking soda - Batch D

Straight out of the oven

After cooling

Mixing the ingredients without “creaming” the sugar, butter, and vanilla first - Batch E

Straight out of the oven

After cooling

Conclusion and Reflection: 10 pts

I found out that you have to be precise when working with recipes. Even small changes to a recipe can have a big impact on the results.

I was surprised that I got different results with the changes we made. I was really surprised with how salty batch D (baking powder instead of baking soda) turned out, and how much taller those cookies turned out compared to the others. I was surprised at how much of a difference gluten-free flour (rice flour) made to the appearance and texture of the cookie. Some of the changes we made to the recipe only involved changes to how we prepared or combined the ingredients (melting the butter and not “creaming” the ingredients first), not what the ingredients were. I was surprised at how much of a difference this made to the texture, taste, and appearance of the cookies when all the ingredients were the same, just prepared differently. I want to find out why that happened.

If I did this project again, I would use a bigger group of taste testers, not just my family. I also want to know more about what gluten is and why it made such a difference in our cookie recipe, and I want to know more about the difference between baking soda and baking powder. I want to find out why preparing the same ingredients a different way also affects the taste and appearance of the cookies - why doesn’t it taste the same if the ingredients are the same? I’m curious about other dessert recipes, and I would like to test cupcakes next. I love baking desserts!