Bake a Cake!

Grade: 3-4

Time: 1 hr

Activity Overview :

Today you are going to be chemists in the kitchen and will be experimenting while baking cakes to determine the roles of some ingredients. You will be doing this by baking 4 cakes, one regular while the other 3 will have a missing ingredient. Then you'll be observing the characteristics of the finished cakes to figure out the impact of each ingredient.

Before you begin the experiment, think about the following question:

- Do you think baking involves science? Why?
- What is the purpose of oil in a cake? Eggs? Baking Soda?

Materials:

Per Cake (You will need to make four mini cakes)

- 6 tablespoons of flour
- 3 tablespoons of sugar
- 1 pinch of salt
- 2-3 pinches of baking powder
- 1/3 of an egg (break and beat the egg in a cup,
- use 1/3 of the mix per cake)
- 2 tablespoons of milk
- 2 tablespoons of cooking oil
- 1/4 teaspoon of vanilla
- Spoon or whisk
- 4 oven safe dishes, or cake pan(s)

Don't worry if you don't have all these supplies. Experiment with other everyday items and see what you can make!

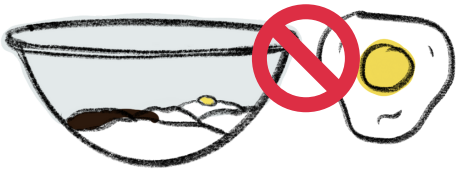
Activity:

1. It's up to you if you want to bake each cake individually or all 4 at the same time. Adjust the instructions below accordingly.
2. For the first cake, start off by mixing all the dry ingredients (flour, sugar, salt, baking powder).
3. Then add the wet ingredients (egg, milk, oil, vanilla). Using a spoon or whisk, mix all the ingredients together thoroughly.
4. For the second cake, repeat steps 2-3 but do not add the cooking oil.
5. For the third cake, repeat steps 2-3 but do not add the egg.
6. For the fourth cake, repeat steps 2-3 but do not add the baking powder.
7. Place them in the oven at 350 °F for 15-20 mins.
8. After they are done, remove them and let them cool. Make sure you keep them in order so you can identify which cake is which. It may help to have a label placed in front of each cake after removing it from the oven.
9. Observe the differences among the cakes. Compare size, texture, appearance and even taste since they are all edible!
10. Try to determine why they are all different and what the purpose of the missing ingredient was.

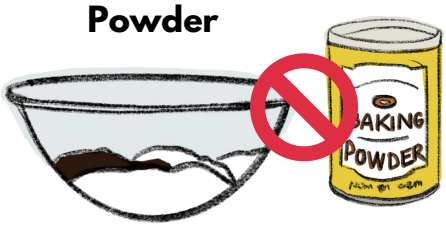
First Cake
All ingredients

Second Cake
- No Oil

Third Cake -
No Egg



Fourth Cake-
No Baking
Powder



Engineering and Science Connections:

Chemistry is seen in baking because a chemical reaction occurs! When heat is added to the cake causing it to change, it's called an endothermic reaction since the heat was absorbed. You saw that there was a reaction with all the ingredients in the cake, but they all played their own role in the cake.

The oil was used in the cake because it is a fat, which adds moisture to the cake after baking.

The eggs were added to the cake to add structure. If you've ever cooked an egg, you'd know that it becomes more solid and firm after it is heated. It adds flavour, richness and colour as well. The egg is also a fat so it adds tenderness to the cake as well.

The baking soda is what makes the cake rise. Too little or too much can leave your cake flat or have it rise too much! This occurs because the baking soda releases carbon dioxide gas which leads to bubbling. This causes the cake to be light and fluffy, but it also makes air pockets which leads it to expand.

A control in an experiment is something that remains constant throughout. It can be used as a reference for the correct outcome. Having a control increases the reliability of the results in the experiment. The control in this baking experiment was the first cake where we included all the ingredients. In this case, it is a negative control because no changes are expected from the predicted outcome.

Extensions:

As an extension, try this experiment with a different recipe like for cookies or banana bread and try to determine the role of specific experiments. It's also a great excuse to make more delicious snacks!

You could also try adding an ingredient to the current recipe and see its impact on the final outcome. Observe any changes present.

Share your creations!

Don't for get to share your experiments and creations with us! We would love to see what you've made. You can Email us at: esqinfo@uwaterloo.ca or send us a message/tag us on our social media!

Facebook: @uwengoutreach **Twitter:** @UWEngOutreach **Instagram:** @uwengoutreach

Thanks for exploring, discovering, and learning with us!

3, 2, 1 Done!

3 - Write or draw 3 things you learned from this activity

2 - Write or draw 2 things you found super interesting or cool and want to learn more about

1 - Do you have any questions about the activity? Did something make you wonder...what if? how? or why?