Scientific Method

Learning Objectives

- Describe the steps of the scientific method

- Explain the difference between theory and law

Scientific Method

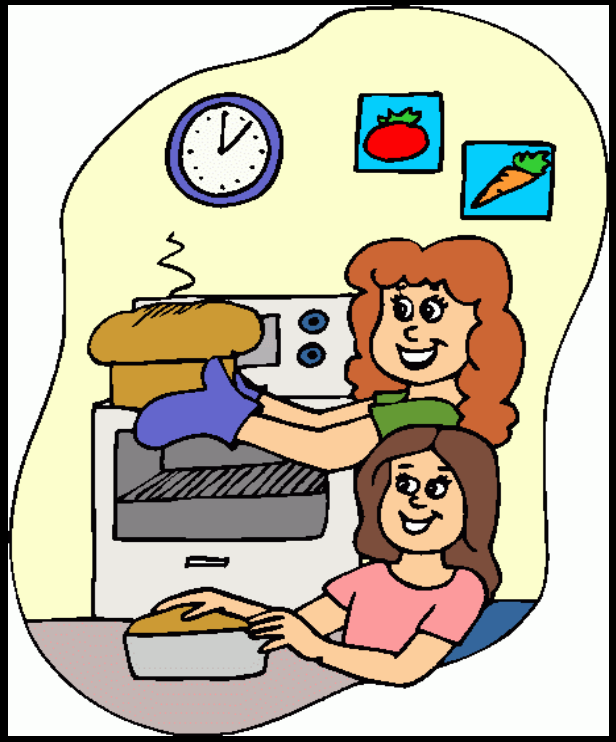
The Scientific Method involves a series of steps that are used to investigate a natural occurrence.

Steps of Scientific Method

1. Problem/Question
2. Observation/Research
3. Hypothesis
4. Experimentation
5. Collect data
6. Analyze results
7. Conclusions
8. Communicate results

Step 1: Problem/Question

Develop a question or problem that can be solved through experimentation.



Taylor watches her mom bake bread. She asks her mom “what makes bread rise?” Her mom explains that yeast in the dough releases a gas as it feeds on sugar.

Does the amount of sugar affect the bread loaf size?

Step 2: Research

Use the library or internet to ensure that you do not repeat mistakes from the past.

Taylor researches the areas of baking and fermentation and tries to come up with a way to test her question.

Step 3: Formulate a Hypothesis

A hypothesis is a proposed explanation based on limited evidence. Used as a starting point.

After much research and thinking, Taylor comes up with a hypothesis:

“If more sugar is added, then the bread will rise higher”

Independent Variable (IV)

The independent, or manipulated variable, is a factor that is intentionally varied by the experimenter.

“If more sugar is added, then the bread will rise higher”

Dependent Variable (DV)

The dependent, or responding variable, is the factor that may change as a result of changes made in the IV.

"If more sugar is added, then the bread will rise higher"

Step 4: Experimentation

Your experiment tests your hypothesis

Taylor creates a step by step procedure and list of needed materials.

She determines her control group and constants.

What are the control group and constants?

Part 1 Stop Here

Control Group

The control is the group that serves as the standard of comparison.

The control group will be the amount of sugar usually added in the recipe.

“If more sugar is added, then the bread will rise higher”

Constants

The constants are all other factors in the experiment that remain the same so that any observed changes are due only to the IV.

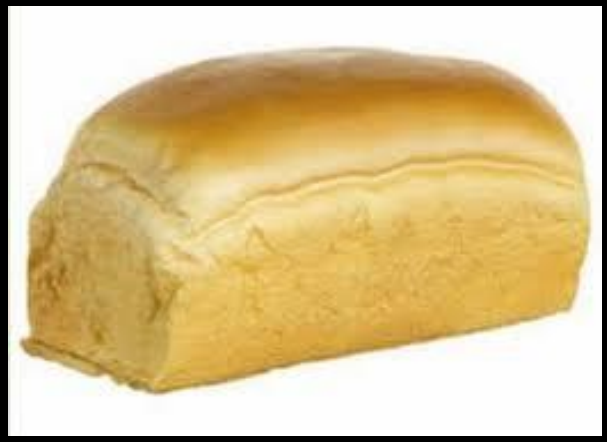
All other ingredients except the sugar

Oven	Rise time	Baking time
Brand of ingredients		Oven temp.
Type of pan used		Location

Name the constants in this experiment

of Trials

Trials refer to replicate groups that are exposed to the same conditions in an experiment.



Taylor is going to repeat her experiment three times.

Step 5: Collect Data

Size of Baked Bread (LxWxH) = cm^3

Amt. of Sugar (g)	Trial #1	Trial #2	Trial #3	Average Size (cm^3)
25	768	744	761	758
50 (Control)	1296	1188	1296	1260
100	1188	1080	1080	1116
250	672	576	588	612

Step 6: Analyze Results

Record and analyze the results of your experiment

Taylor examines her data and notices that her control (50g sugar) group worked the best in this experiment.

Step 7: Conclusion

Determine whether your hypothesis was correct or not

Taylor rejects her original hypothesis and concludes that 50g of sugar was the optimal amount to produce the largest loaf of bread.

Step 8: Communicate Results

Explain your results by presenting your experiment, observations and conclusions

Taylor tells her mom about her findings.

Now it's Your Turn to Design an Experiment Using the Scientific Method

Stop Here