The Scientific Method

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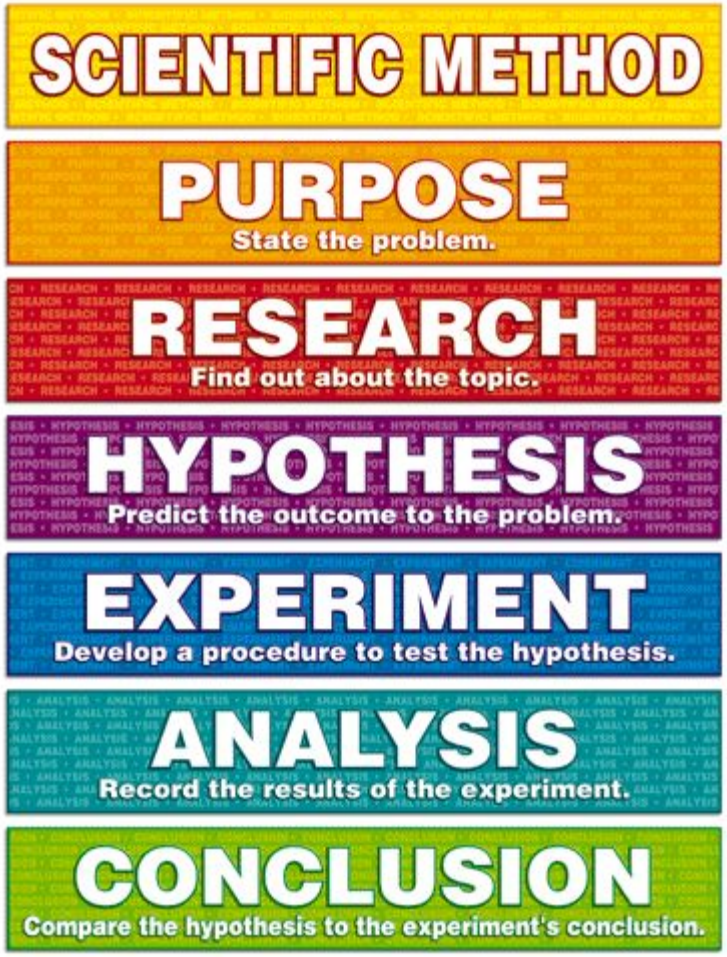

SCIENTIFIC METHOD
PURPOSE
State the problem.
RESEARCH
Find out about the topic.
HYPOTHESIS
Predict the outcome to the problem.
EXPERIMENT
Develop a procedure to test the hypothesis.
ANALYSIS
Record the results of the experiment.
CONCLUSION
Compare the hypothesis to the experiment's conclusion.

What is the Scientific Method?

- The principles and procedures for the systematic pursuit of knowledge

What is the Purpose?

- The problem or research question and the single most important part of the scientific method

- Every part of the experiment is designed to solve this problem or answer this question

What is Research?

- Finding materials and sources in order to establish facts and to reach a better understanding of the problem or question at hand

What is the Hypothesis?

- An educated statement or guess used to predict the outcome of an experiment

(If . . . then . . . because . . . .)

What is the Experiment?

- Experiments are designed and performed to test the hypothesis

What is the Independent Variable?

- The independent variable represents the treatment or experimental variable that is manipulated by the researcher

What is the Dependent Variable?

- The dependent variable represents a response, behavior, or outcome that the researcher wishes to predict or explain

What is the Procedure?

- The procedure includes a step-by-step description of how the experiment will be conducted

What are the Materials?

- The materials is a list of all necessary supplies and equipment used to conduct the experiment

The Importance of Safety in the Science Lab

- Any important safety equipment or procedures should also be included in the materials & procedures

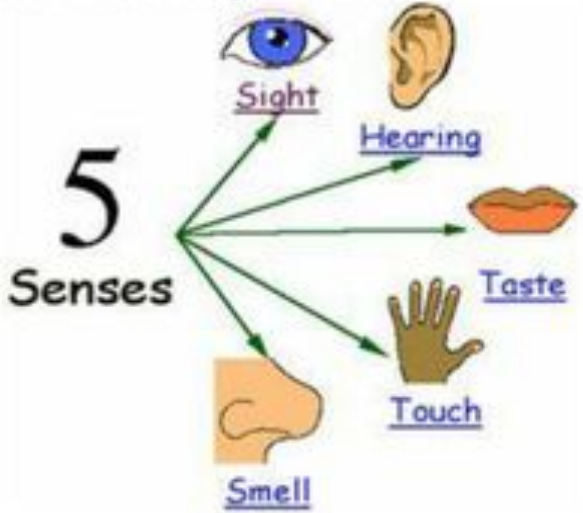
What is the Analysis?

- The organization of observations and collected data to find patterns, often via tables and graphs

Quantitative vs. Qualitative

QUANTITATIVE Data refers to measurable observations. Tools for quantitative data include:

QUALITATIVE Data refers to observations using five senses:

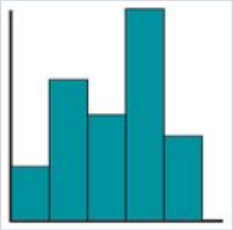
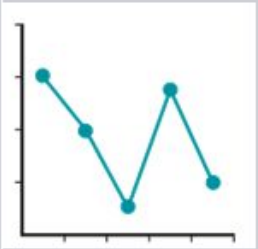


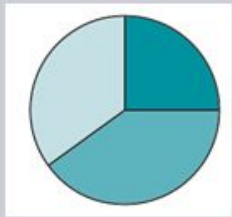
What is Quantitative Data?

- Measurements with numerical values
- Examples include: area, volume, weight, speed, temperature, humidity
- ***Histograms***, ***line graphs***, and ***stem & leaf plots*** can be used to represent quantitative data

What is Qualitative Data?

- Observations and descriptive values
- Examples include: colors, textures, smells, tastes, appearance
- ***Pie charts*** and ***bar graphs*** can be used to represent qualitative data

Type of Graph	Definition
Histogram	 A histogram is a bar graph of a frequency distribution of quantitative data; the horizontal axis is a number line.
Time Series	 A line graph uses straight lines to connect points plotted at the value of each measurement above the time it was taken.
Stem-and-Leaf Plot	Stem | Leaf 33 | 00117 34 | 0112 A stem-and-leaf plot retains the original data; the leaves are the last significant digit in each data value and the stems are the remaining digits.

Type of Graph	Definition
Pie Chart	 A pie chart shows how large each category is in relation to the whole; that is, it uses the relative frequencies from the frequency distribution to divide the “pie” into different-sized wedges. It can only be used to display qualitative data.
Bar Graph	 In a bar graph, bars are used to represent the amount of data in each category; one axis displays the categories of qualitative data and the other axis displays the frequencies.

What is the Conclusion?

- The conclusion summarizes the results of the experiment
- Describes if the hypothesis was supported or not, using the analyzed data
- Explains any potential experimental errors