Scientific Method

The scientific method is an organized, logical approach used to solve a problem or question. The scientific method is a list of steps that is not set in stone, rather it is used as a guide or frame for problem solving.
Steps of the scientific method:

• 1. **State the problem or question:**
  – Before the problem or question can be stated the following must be done.
    • a. **Observations** - Observations lead to questions, ultimately, you will focus on one question that has arisen through observation.
      – i. **Observation** - The use of all or some of the senses (sight, taste, feel, hearing, or smell) to gather information.
      – ii. **Inference** - An assumption based on observation.
BEEN CLIMBING TREES?

I KNOW, DIET TIME

THAT'S THE BIGGEST SLINGSHOT I'VE EVER SEEN
Tethercat

Oh please, oh please....

Aaaaaaaaaaaaaa! Get it off me! Get it off me!... Hello... my name's Joey... Hello... Aaaaaaaaaaaaaa! Get it off me!

PET WORLD

1988
2. Gather information -

• Information must be gathered about the question or problem before you can move to step three. The following must be kept in mind when gathering information:
  – a. **Accuracy** - How close your measurements are to being correct.
  – b. **Precision** – Refers to how close the measurements are to each other.
    • You can be very precise and not **accurate** at the same time.
Accurate and Precise

Precise, but NOT Accurate
2. Gather information (cont’d) -

• **c. Quantitative analysis** – analysis based on measurement.
  
  – *Example: 85 millimeters long, 12 cars, 342 million miles, etc…..*

• **d. Qualitative analysis** – analysis not based on numbers or measurement.
  
  – *Example: Rock composed of silica and quartz, yellow star, liquid is composed of hydrogen and oxygen, etc…….*
3. Hypothesis

- Once a problem or question has been stated a hypothesis must be created. A hypothesis is a possible solution to a question or problem based on observation and measurement.
  
  a. A hypothesis must be in the form of a statement. Example:
    
    - Correct - Tornadoes are formed due to the severe pressure gradient found in thunderstorms.
    - Incorrect – Maybe tornadoes are formed due to the severe pressure gradient found in thunderstorms.
4. Test the hypothesis

• Once a hypothesis has been proposed it must be tested to see if it is valid. A hypothesis is tested through controlled experimentation. A controlled experiment must contain the following:

  a. Control variables – Variables that are kept the same during the experiment.

    • Example: Type of plant, soil used, size of pot…….
4. Test the hypothesis (cont’d)

- **b. Independent variable** – The variable that is purposely changed in the experiment.
  
  • *Example: The amount of sunlight a plant receives.*

- **c. Dependent variable** – Variable that changes due to the value of the independent variable.
  
  • *Example: The size of the plant.*

- **d. Experiment must be repeated** more than once to make sure that the results are valid. *(law of large numbers)*
• “I am the experimenter, I choose the IV”
• Whatever you have control of, or whatever has already been set for you, is the independent variable
5. **State a conclusion**

- The hypothesis must be denied or supported through data created during the experiment.
  - **a.** When writing the conclusion the hypothesis must be stated.
  - **b.** State the data that **denies or supports** the hypothesis.
IV or DV?

Runners are asked to run as far as they can in a certain time.

<table>
<thead>
<tr>
<th>Distance Ran</th>
<th>Time Allowed</th>
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<tbody>
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Rocks are dropped from different heights and time is recorded for the rock to fall from each height.

<table>
<thead>
<tr>
<th>Drop Height</th>
<th>Time to drop</th>
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Different amounts of dog food is given to dogs and they are weighed every week.

<table>
<thead>
<tr>
<th>Amount of Dog Food</th>
<th>Dog Weight</th>
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IV or DV?

Four planes fly the same distance and each of their flight times are recorded.

<table>
<thead>
<tr>
<th>Distance Flown</th>
<th>Flight Time</th>
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