

# Scientific Method

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- ## Steps in the Scientific Method
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- Observation
  - Research
  - Hypothesis
  - Experiment
  - Data Collection
  - Conclusion
  - Retest

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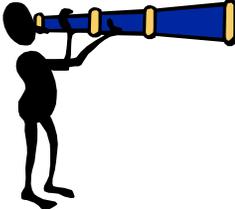
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- ## Observations/Question
- Gathered through your **senses**
  - A scientist notices something in their **natural world**
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## Research

- What do you need to know?
- How are you going to find this?
- Look at others' findings



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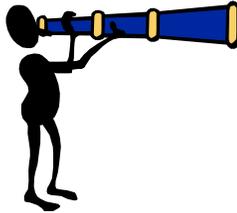
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## Observations

- An **example of an observation** might be noticing that many salamanders near a pond have curved, not straight, tails



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## Hypothesis

- A suggested solution to the problem.
- Must be **testable**
- Sometimes written as **If...Then...** statements
- **Predicts** an outcome



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## Hypothesis

- An **example of a hypothesis** might be that the salamanders have curved tails due to a pollutant in the moist soil where they live.



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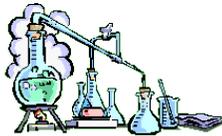
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## Experiment

- A procedure to **test** the hypothesis.



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## Experiment

**Variable** -  
factor in the  
experiment  
that is being  
tested



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## Experiment

A good or  
"valid"  
experiment  
will only have  
**ONE**  
variable!



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## Controls and Variables

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## Scientific Experiments Follow Rules

- An experimenter **changes one factor** and **observes or measures** what happens.



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## The Control Variable

- The experimenter makes a special effort to keep **other factors constant** so that they will not effect the outcome.
- Those factors are called **control variables**.

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## What is the Purpose of a Control?

- Controls are **NOT** being tested
- Controls are used for **COMPARISON**

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## Other Variables

- The factor that is changed is known as the **independent variable**.
- The factor that is measured or observed is called the **dependent variable**.

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## Example of Controls & Variables

- For example, suppose you want to figure out the fastest route to walk home from school.
- You will try several different routes and time how long it takes you to get home by each one.
- Since you are only interested in finding a route that is fastest for you, you will do the walking yourself.

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## What are the Variables in Your Experiment?

- Varying the route is the independent variable
- The time it takes is the dependent variable
- Keeping the same walker throughout makes the walker a control variable.

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One more thing... it is best to make several trials with each independent variable.

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## Valid Experiments

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- ### Remember: To be a Valid Experiment:
- **Two groups** are required --- the control & experimental groups
  - There should be only **one variable**

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- ## Data
- **Results** of the experiment
  - May be **quantitative** (numbers) or **qualitative**
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## Data

- Must be **organized**
- Can be organized into **charts, tables, or graphs**



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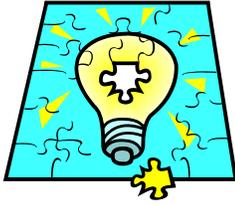
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## Conclusion

- The **answer** to the hypothesis based on the **data obtained from the experiment**



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## Retest

In order to **verify the results**, experiments must be **retested**.



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 **Review**

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 **Solving a Problem**

- 1) **Identify** a Problem
- 2) State **Observations** about the problem
- 3) Form a **Hypothesis** about the problem (if...then...)
- 4) Design an **Experiment to test the hypothesis**
- 5) Collect **Data**
- 6) Form a **Conclusion**
- 7) **Retest**



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