



Scientific Method

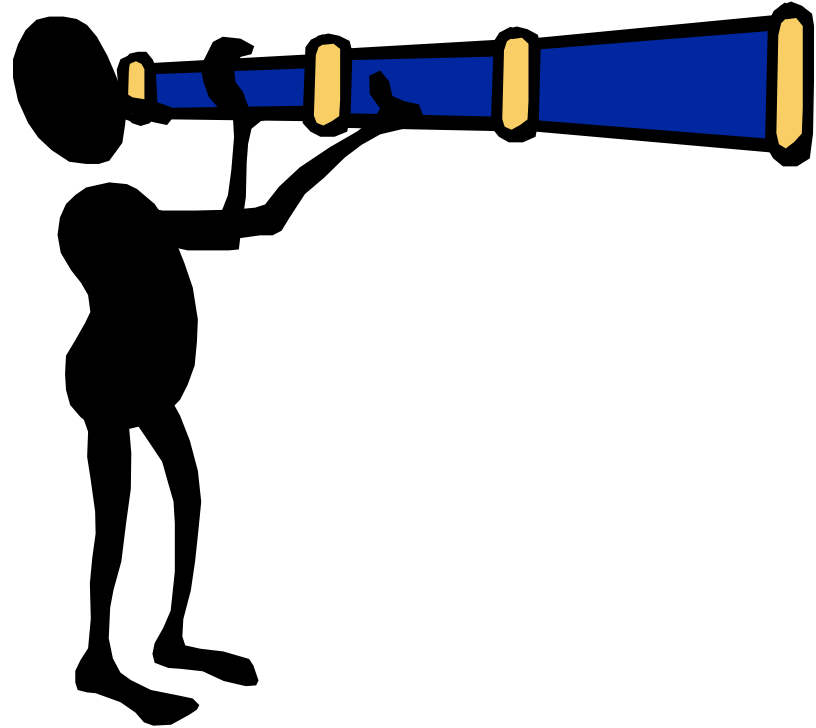
Steps in the Scientific Method



- Observation
- Question
- Hypothesis
- Experiment
- Data Collection
- Conclusion
- Retest

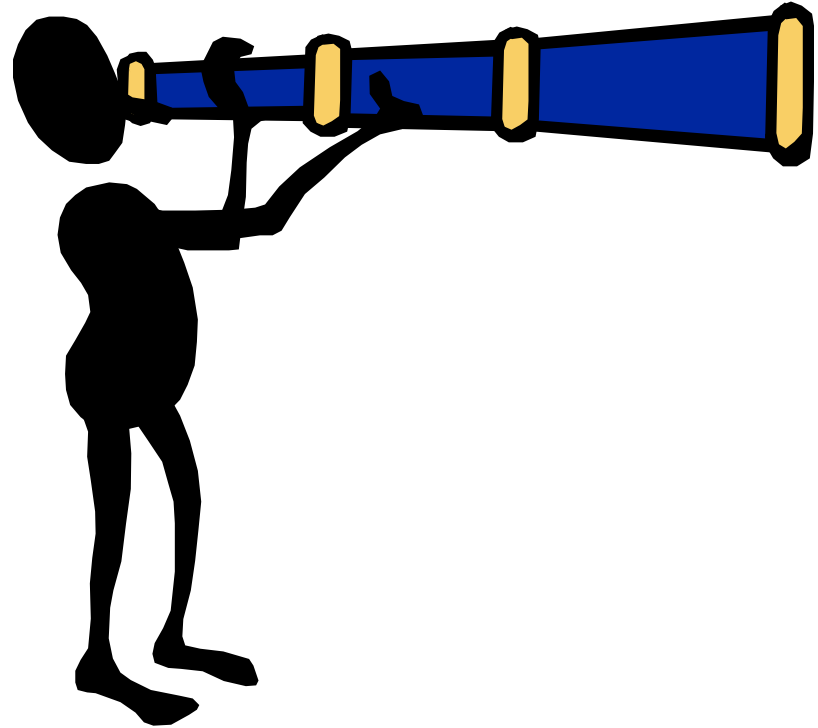
Observations

- Gathered through your **senses**
- A scientist notices something in their **natural world**



Observations

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



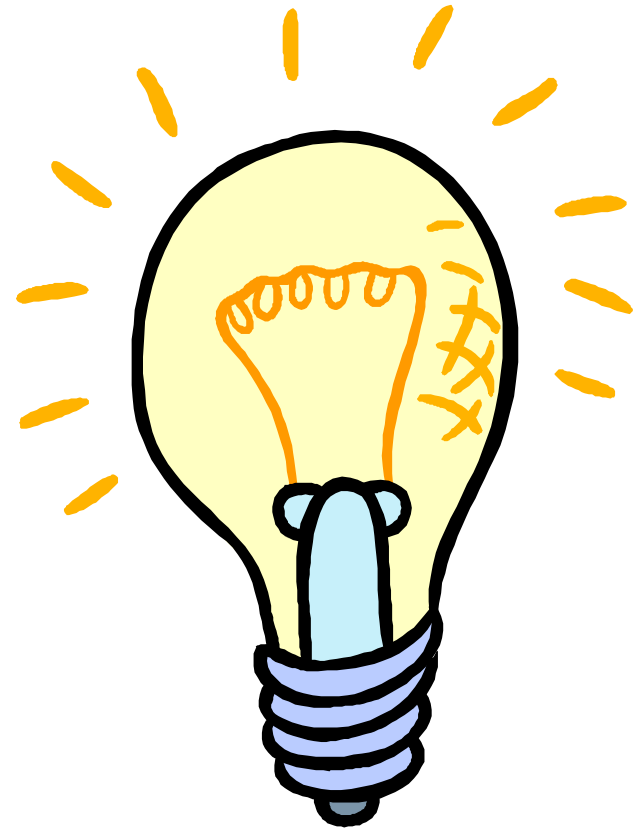


Question

- The quality of the question will depend on how carefully the observations were made and analyzed.

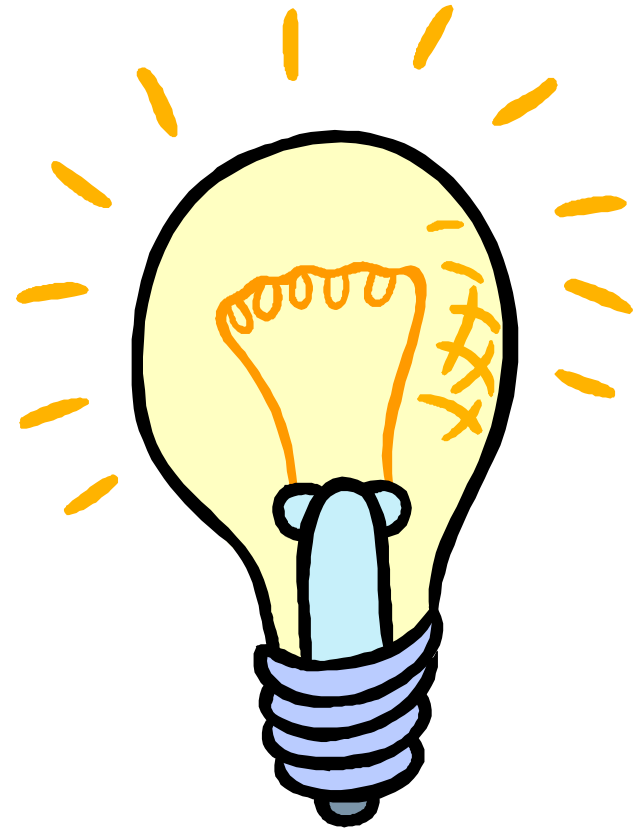
Hypothesis

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



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.





Experiment

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





Experiment

Variable -
factor in the
experiment
that is being
tested





Experiment

A good or
“valid”
experiment
will only have
ONE
variable!





Controls and Variables

Scientific Experiments Follow Rules

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





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**.

What is the Purpose of a Control?



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



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**.



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**.

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.**



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



Valid Experiments



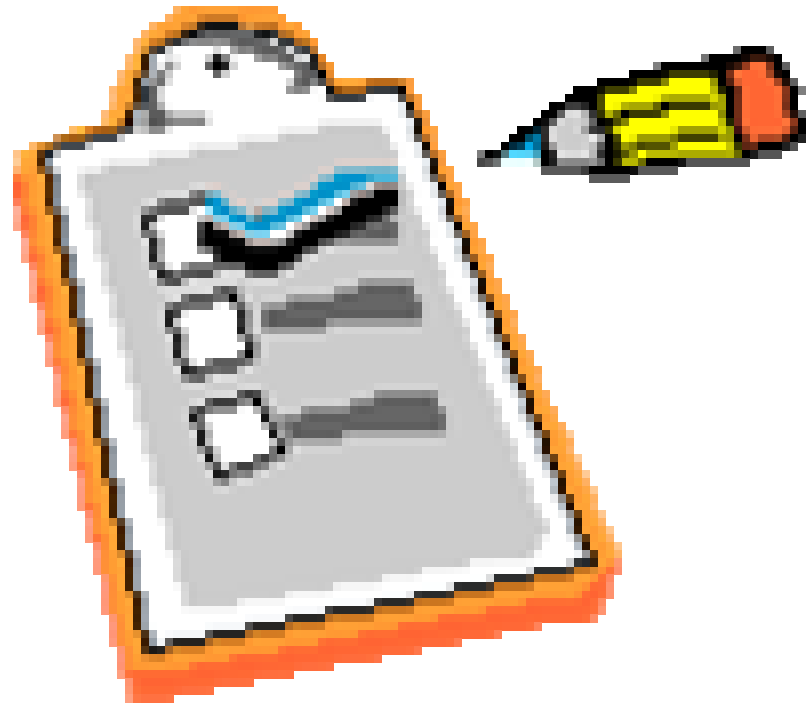
Remember: To be a Valid Experiment:

- **Two groups** are required --- the control & experimental groups
- There should be only **one variable**



Data

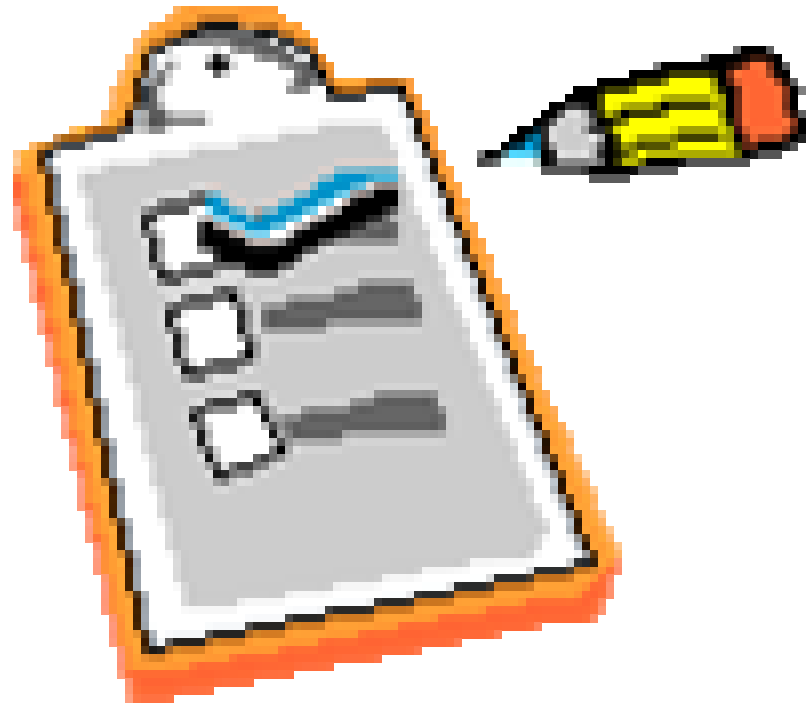
- **Results** of the experiment
- May be **quantitative** (numbers) or **qualitative**





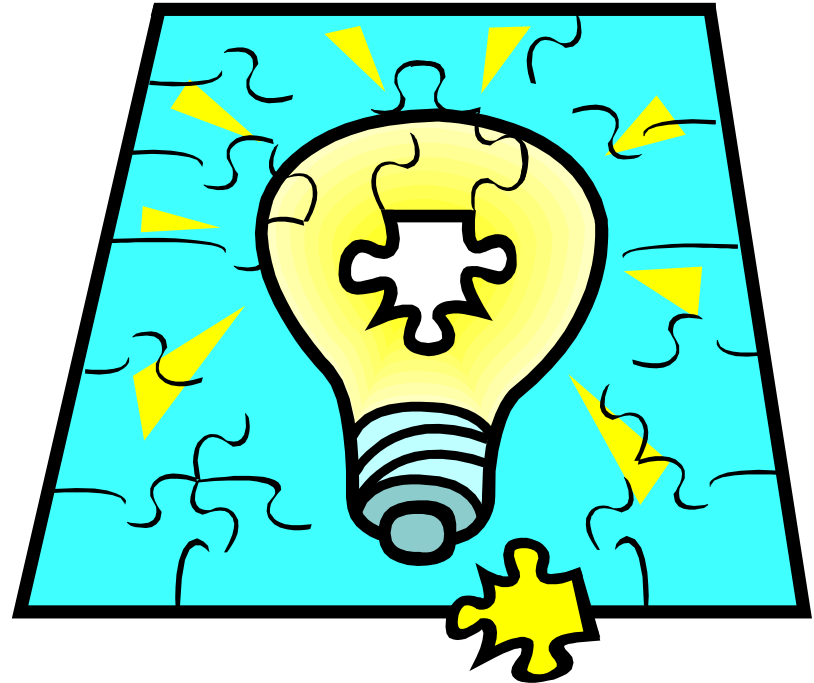
Data

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



Conclusion

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





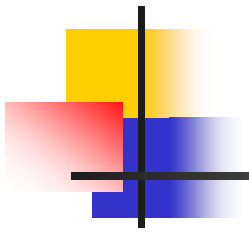
Retest

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





Review



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**

