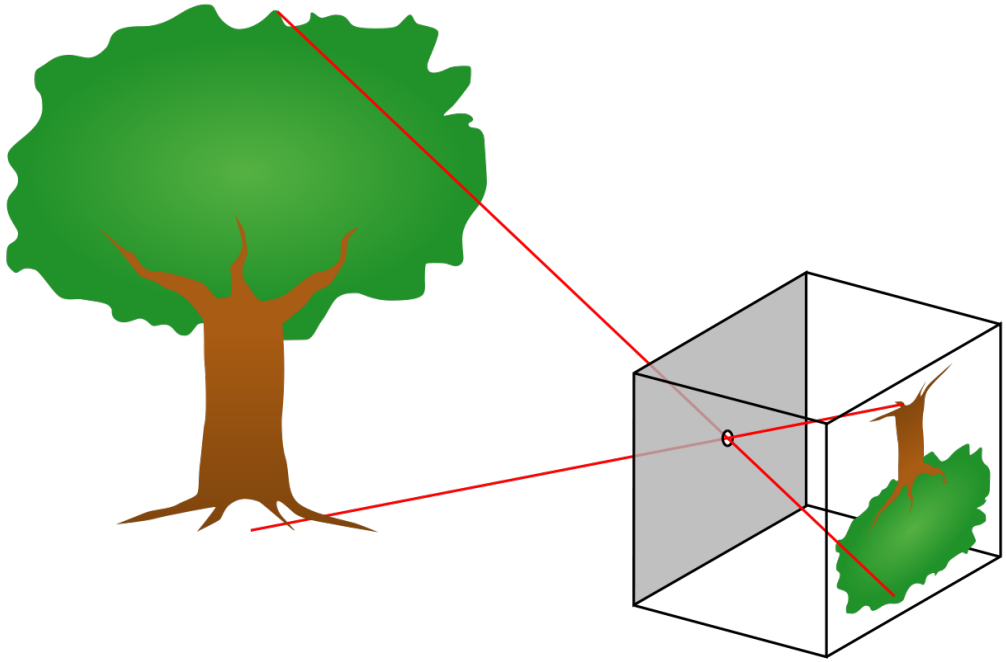
Scientific Method—9 Steps



Mrs. Hoenshell
Science

Topic: Steps to the Scientific Method

Objective: "I can write the steps to the scientific method and be able to explain the differences in the steps and give examples."

Essential Questions: What is important about the steps to the scientific process? How do we use the steps to test a theory?

Think Time

What is the scientific method?

Without talking, think about a one sentence definition for the scientific method.

DO NOT TALK WITH CLASSMATES!

What is the scientific method?	A process for experimentation that is used to explore observations and answer questions about the natural world.

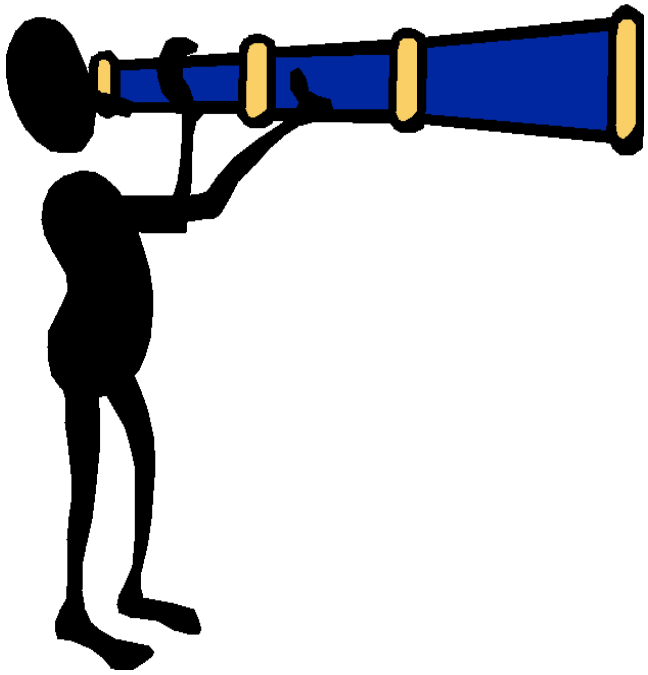
What is the natural world?	• Natural science seeks to understand the natural world around us and how it works.
	• There are five major branches of the natural world:
	  • Chemistry
	  • Earth science
	  • Physics
	  • Astronomy
	  • Biology (Life Science)

Observations

1st Step--
Observation

Gathered through your five **senses.**

A scientist notices something in their **natural world.**



THINK TIME

Look at the picture.

List 3 observations

Question/Problem

2nd Step—Question or Stating a Problem

Based on what you observed

You wonder why something looks they way it does, acts the way it does, could you do something different.

WRITE

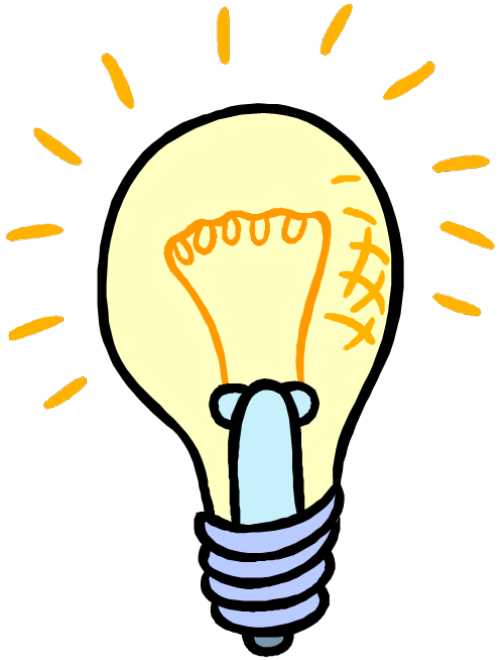
Write a question for the 3 observations you made

Hypothesis

3rd Step—

Simple Answer

- Simple answer to your question
- Must be testable



Literature Review

What is the 4th Step of the Scientific Method?

- Before you can test your theories, it is important to find out information about your theory.
- Search for information if any one has ever done this experiment or Asked the same question.
  - **What were their results?**
  - **Change your hypothesis based on what you find out**

Literature Review

How many sources must you use for your literature review?

- You must find at least 3 different sources
  1. Interview with a professional associated with your theory.
  2. Online resource
  3. Journal/Article

Literature Review

With your shoulder partner, list where you could find information for your theories?

List 3 places you would try to find information about your theories.

Deductive Reasoning Statement

What is the 5th step of the scientific method?

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

Deductive Reasoning Statement

How do I write an If, Then statement?

- The **if** will always be your **independent variable**
- The **then** will always be your **dependent variable**

Deductive Reasoning Statement

What is an independent variable?

- The independent variable is **what you are testing**.
- If you want to know how much sunlight sunflowers need to grow, your independent variable would be the amount of sunlight.

Deductive Reasoning Statement

What is a dependent variable?

The dependent variable is **what changes because of what you are testing**.

You want to know how much sunlight sunflowers need to grow, your dependent variable would be the amount of growth of your sunflowers.

Example—Deductive Reasoning Statement

What would be your deductive Reasoning Statement for the sunflowers?	If sunflowers receive at least five hours of direct sunlight each day, then the sunflowers will grow at least one-two inches a week.

Experiment

What is the 6th step of the scientific method?	A procedure called an experiment to test your hypothesis and deductive reasoning statement.

Experiment

What is a valid experiment?	• A good or "valid" experiment will only have ONE independent variable! • Conduct several trials

Data Collection and Analysis

What is the 7th step of the scientific method?

- **Results** of the experiment
- May be **quantitative** (numbers) or **qualitative** (descriptive—harder to prove)

Data Collection and Analysis

What is the 7th step of the scientific method?

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

Graphing Data Collection for Analysis

How do I graph my results?

DEPENDENT VARIABLE

What changes because of what you are testing.

INDEPENDENT VARIABLE

What you are testing

CONCLUSION

What is the 8th step of the scientific method?	The **answer** to the hypothesis based on the **data obtained from the experiment.**

PEER REVIEW

What is the 9th step of the scientific method?	Peer Review—Submit to a scientific journal.

Summary:

1) Identify a Problem or Question
2) State Observations about the problem
3) Form a Hypothesis
4) Literature Review—Has someone already asked the same question
5) Deductive Reasoning Statement: about the problem (if…then…)
6) Design an Experiment to test the hypothesis
7) Collect Data
8) Form a Conclusion
9) Peer Review

Exit Ticket: You will have a quiz on this.

List the 9 steps to the scientific method. Which steps were new to you? Why would those steps be important for your future investigations?