Scientific Method of Inquiry

A technique for finding out reliable information

What is the Scientific Method?

- A <u>process</u> designed <u>to solve problems</u> in a logical manner
- A <u>strategy for drawing sound conclusions</u>
- A <u>flexible</u> series of <u>steps</u> that must be <u>adjusted depending on what is being studied</u>

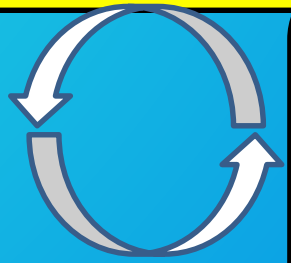
Components of the Sci. Method

Ask Questions

Determine problem to solve or information to learn

Make Observations

Gather information (before experimentation)



Publish the Results

Sharing results with others

Propose a Hypothesis

Suggest reasonable & testable explanation of observations

Perform an Experiment

Test hypothesis by changing a variable & recording results

More on the Performing the Experiment

- **Controlled experiment**—an experiment that tests (i.e. changes) ONLY ONE variable at a time; the preferred method of experimentation
- **Variable**—a factor that could affect the result of an experiment
  - **Independent variable**— . . .
  - **Dependent variable**— . . .
  - **Controlled variable**— . . .

More on the Performing the Experiment

- **Variable**— . . .
  - **Independent variable**—the variable controlled/manipulated/tested by the experimenter; i.e. time, days of sunlight, etc.
  - **Dependent variable**—the variable(s) that react to the independent variable and is being observed or measured; i.e. amount of erosion, change in temperature
  - **Controlled variable**—a variable kept constant from one experiment to the next

More on the Publishing of Results

- **Theory**—a hypothesis that has withstood repeated testing; a well-tested explanation of observations
- **Law**—a statement or mathematical expression that reliably describes a natural event

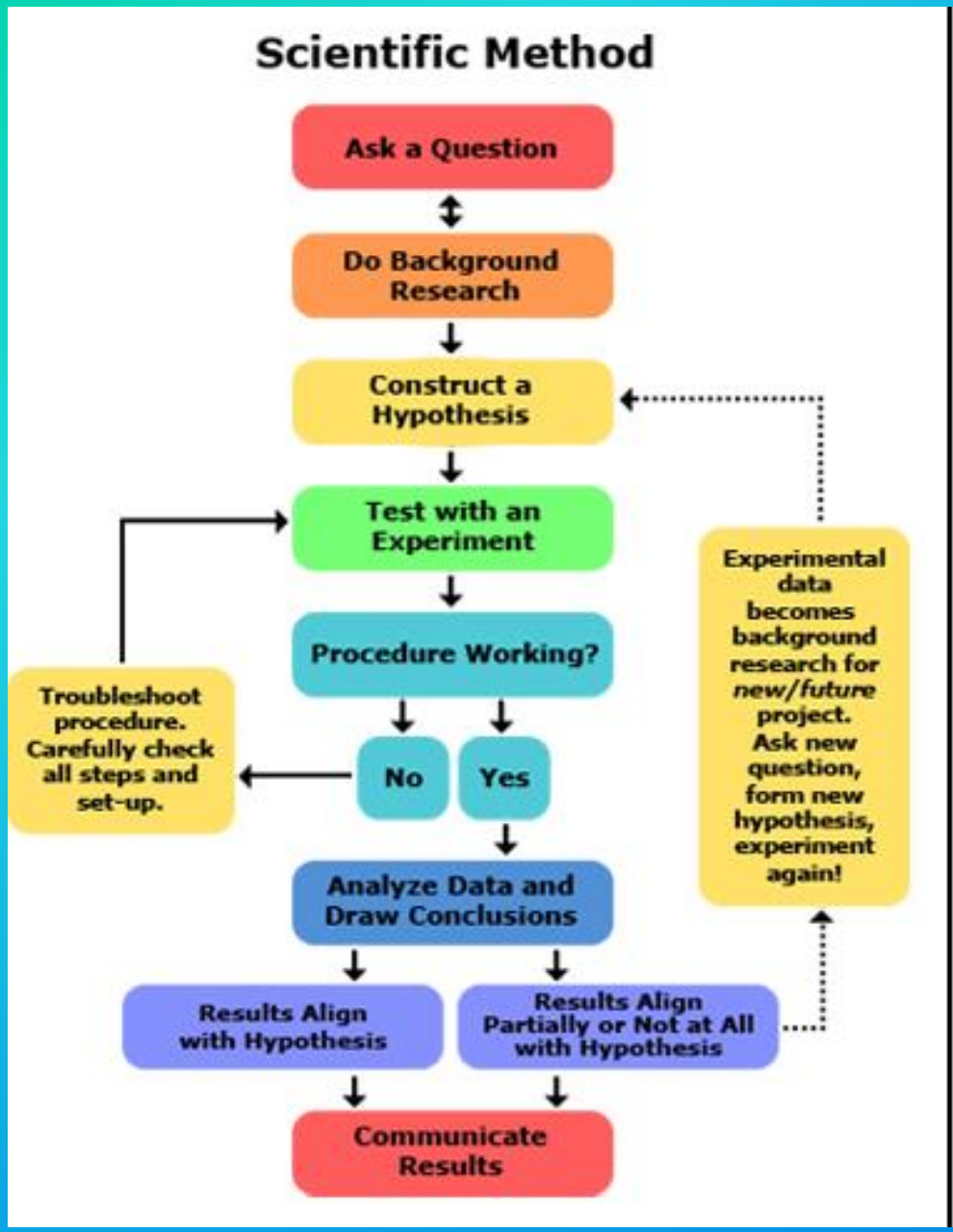
KEY Comparison:

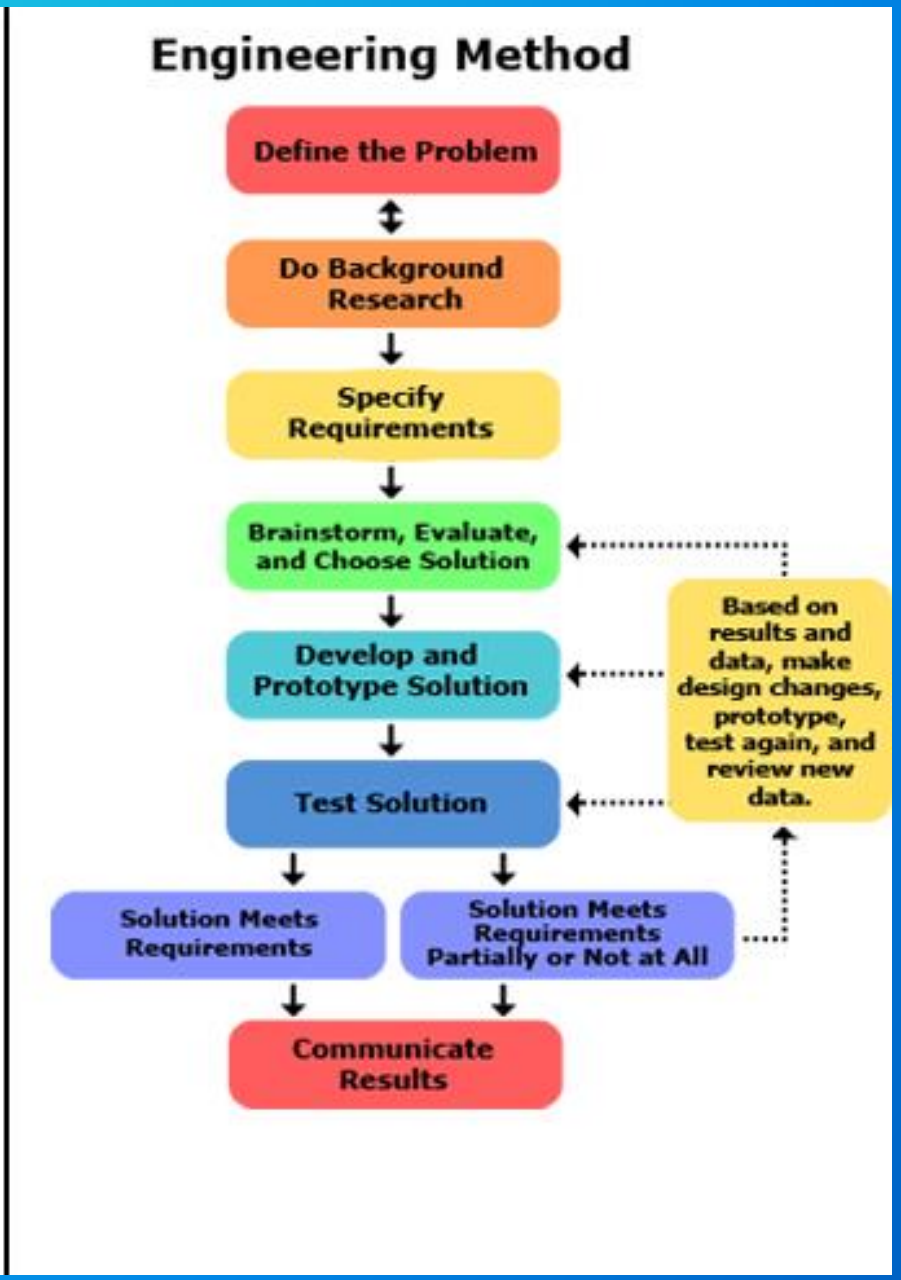
A **hypothesis predicts what** event will occur . . .

A **theory explains why or how** an event occurs . . .

A **law describes the way** the event occurs.

Example: A ball falling to the ground


Scientific Method
Ask a Question
Do Background Research
Construct a Hypothesis
Test with an Experiment
Procedure Working?
No
Yes
Troubleshoot procedure. Carefully check all steps and set-up.
Analyze Data and Draw Conclusions
Results Align with Hypothesis
Results Align Partially or Not at All with Hypothesis
Experimental data becomes background research for *new/future* project. Ask new question, form new hypothesis, experiment again!
Communicate Results


Engineering Method
Define the Problem
Do Background Research
Specify Requirements
Brainstorm, Evaluate, and Choose Solution
Develop and Prototype Solution
Test Solution
Based on results and data, make design changes, prototype, test again, and review new data.
Solution Meets Requirements
Solution Meets Requirements Partially or Not at All
Communicate Results