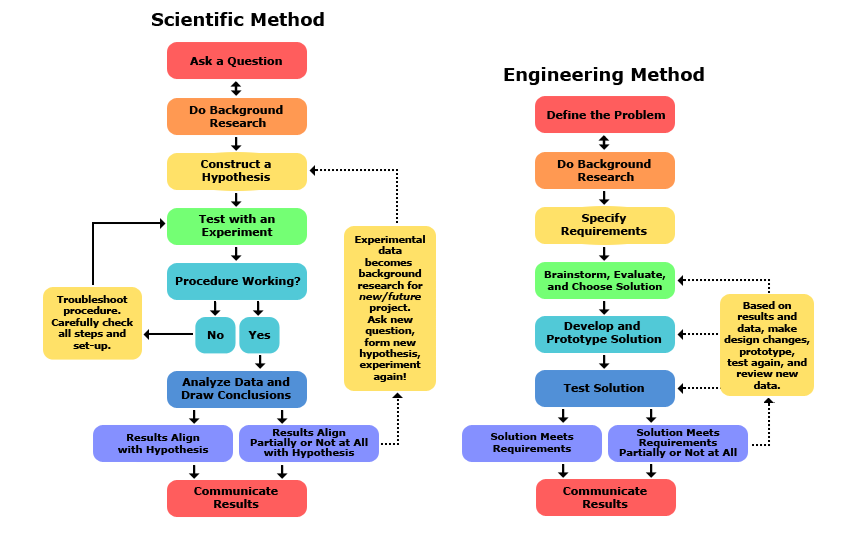
**Nature of Science & Engineering: Conducting a Scientific Investigation Notes**

September 22nd

**The Scientific Method & Engineering Method**



The Scientific Method

* Step 1
  + **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
  + For example: “I wonder what type of bird seed I should put in my feeders.”
* Step 2
  + **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
  + Head to the library for resources, do online research, ask someone at a retail store that sells bird seed
* Step 3
  + **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
  + An Observation is noting or detecting phenomenon through the senses.
  + Spend time watching birds in the wild or at other feeders.
* Step 4
  + **Construct a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ based on an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**
  + A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is a suggested explanation based on evidence that can be tested by observation or experimentation.
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ statement
  + “If birds like a variety of seeds in the wild, then they prefer a mixed seed at the feeders.”
* Step 5
  + **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
  + An \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is a special type of investigation that is performed under \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to test a hypothesis
* Step 5 (con’t)
  + Test **Variables** - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Two types:
    - **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** – the variable in an experiment that is being measured.
    - **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** – the variable in an experiment that is being changed to observe the effect on the dependent variable.
* Step 5 (con’t)
  + Bird Seed Experiment:
    - Dependent Variable: **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
    - Independent Variable: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + You will record the amount of bird seed consumed by the birds for each of the different types of seed.
  + You will offer at least two different types of seed for the birds.
    - Mixed seeds (going back to your hypothesis)
    - Another type of seed based on your background research and/or observations (maybe sunflower seeds)
* Step 6
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Have step by step detailed instructions on how to set up and run the experiment so that anyone can duplicate it
  + Step 1: Set out two identical bird feeders – one with 8 cups of mixed seed, one with 8 cups of sunflower seeds
* Step 7
  + **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** – is the procedure working?
  + If not, figure out \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to better answer your question.
  + Are squirrels getting to the feeders and eating all the seeds? You may need to change the location of the feeders.
  + Note changes to the procedure.
* Step 8
  + **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
  + Be sure to collect enough data – make observations at least \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + For example: set out, collect and weigh the remaining bird seed three times and calculate the average amount of seed left over
* Step 8 (con’t)
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Make charts, graphs, tables, etc. to show your data
  + Do not make tables and graphs that show the same thing!
  + For example:
    - Make a graph comparing the amount of seed left over from the three trials from each bird feeder
    - Make a table showing the average amount of seed left over
* Step 9
  + **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**– the data you collected!
  + Show these using your graphs, charts, tables, etc. AND **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** those tables and results.
* Step 10
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ – What did you learn from your results?
  + Can you accept your \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_?
    - Do birds prefer mixed seeds at bird feeders based on your experiment?
  + You may have to \_\_\_\_\_\_\_\_\_\_\_\_\_ your hypothesis. (And that’s okay!)
  + If you reject your hypothesis, how can you retest?
  + What changes would you make to your experimental method?
* Step 11
  + **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
  + Presentation! Report!
  + Compile all your hard work – question, research, hypothesis, materials, procedure, results, and conclusion – and present it to classmates, coworkers, etc. in the form of a research paper or presentation