

# Unit 3- Lesson 1

Chemistry 0

Feb 2021, L. Tracey Gao



# Scientific Inquiry

- Observation
- Research
- Hypothesis
- Experiment
- Data collection and analysis
- Conclusion
- Communication of ideas and results

# Observation

- Scientists explore and collect information with their senses and ask questions that they would like to answer.
- Questions guide scientists in their research and can usually be answered by collecting evidence.



# Background Research

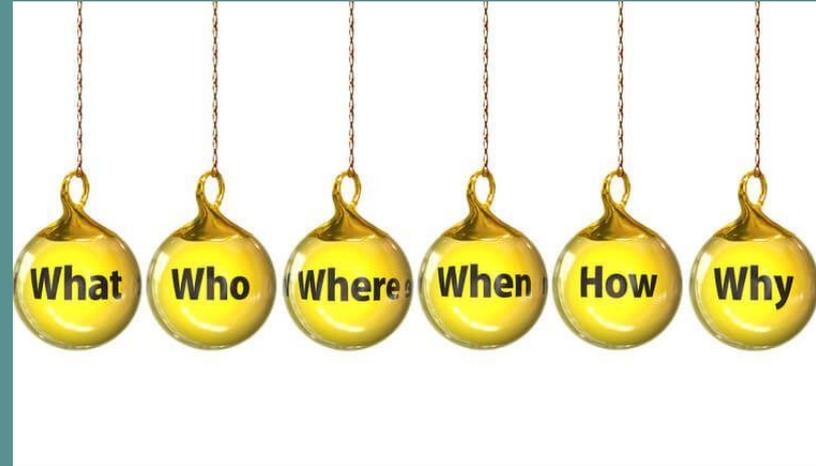
- Scientists perform background research including reading papers and books on past research.
- They might find the other scientists have conducted experiments that try to answer a similar question.
- It can help scientists better understand their observations and questions before their own experiment.



[www.centralaz.edu](http://www.centralaz.edu)

# Hypothesis

- With a question in mind, scientists state clearly what they plan to test during their experiment. This statement is called hypothesis.
- It is a predicted answer to scientific question or an educated guess that may explain an observation.
- A hypothesis guides the experiment.



<https://www.enago.com/academy/how-to-develop-a-good-research-hypothesis/>

# Experiment

- After making a hypothesis, scientists design and conduct an experiment.
- Scientists must be sure to design the experiment so that only one factor is tested at a time so they will know that their results are directly related to the one factor that was changed.
- It may take several tries to design a right experiment.



<https://www.pdx.edu/chemistry/undergraduate-programs-chemistry-and-biochemistry>

# Data collection and analysis

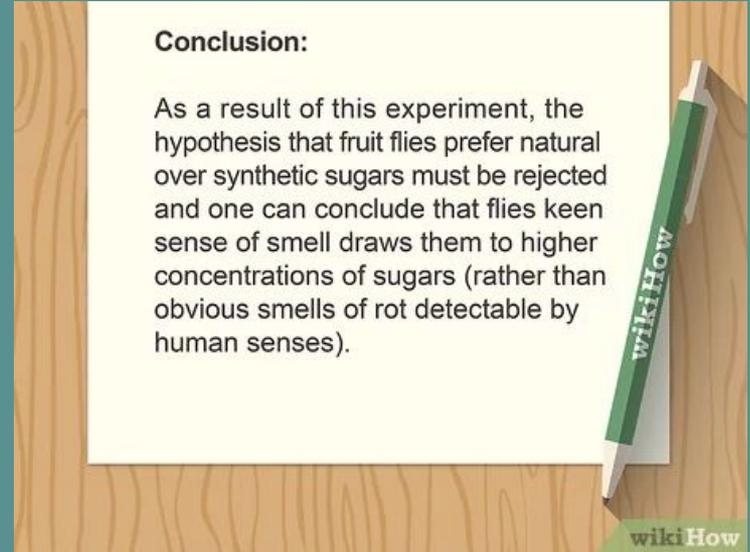
- Data are pieces of information collected before, during and after an experiment.
- It is important to keep detailed notes and to record all data during an experiment so that it can be analyzed to determine the results.
- Sometime scientists may also choose to record data on a table and then put the information into a graph.
- They also need to make sure they collect accurate data so that they can trust the results, and also repeat an experiment to see if they can obtain the same results.



<https://www.scinote.net/electronic-lab-notebook-perception-study/>

# Conclusion

- A conclusion is a statement that tells whether or not the hypothesis was correct.
- If the data support the hypothesis, then the hypothesis is considered correct or valid.
- If the data do not support the hypothesis, then the hypothesis is considered incorrect or invalid.
- Scientist learn something from both valid and invalid hypothesis. Both of them lead to scientific learning.



<https://www.wikihow.com/Write-a-Science-Lab-Report>

# Communication

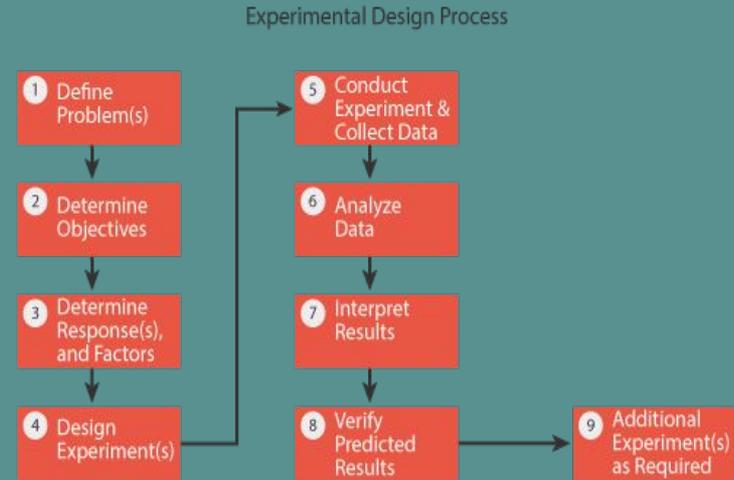
- Scientists will often report their findings in journals or speeches to tell others what they have learned.
- They may create diagrams or other images to show their results.
- Communication is very important!
- It gives other people a chance to learn more and at the same time, it also allows scientists to improve their own experiments when other people comment on the results.



<https://images.app.goo.gl/WFu7izsiT9Wriwis6>

# Designing an experiment

- Scientists need to figure out a plan for testing a hypothesis. To do this, they need to design an experiment.
- They need to vary only one factor of their experiment at a time so that they know that the results are related to the one factor that was altered.
- When designing an experiment, scientists must also identify the variables and controls.



<https://www.moresteam.com/toolbox/design-of-experiments.cfm>

# This week's assignment

- Title: Ageless Apples
- Overview:
  - Place apple slices into solutions that are acids, bases or neutral.
  - A day later, examine the apples and can see dramatic differences in how much each of the slices browned.
  - Explore how acidity changes reaction rates.



# This week's assignment

- Inquiry questions:
  - How do we know if a chemical or physical change has occurred?
  - What is an acid and a base, and how do they affect the rate at which an apple browns?
  - What chemical reaction causes apples to brown and how can we slow this process using our knowledge of acids and bases?



# This week's assignment

- Please complete the assignment using a report:
  - Start to think about the inquiry questions stated in the previous slide. Perform background research on these topics.
  - Make your hypothesis before you start the experiment: What effect do you think each of the liquids will have on the apple? Draw what you think each sample might look like tomorrow.
  - The procedure of the experiment will be handed out in your assignment portal, please paste them to your report. Record your observations of the experiment.
  - Analyze and discuss your results (data collection and analysis) using the questions in your assignment sheet.
  - Provide your conclusion of the experiment in your report.
  - Presentations (communication) can be shown in our next class.