**Unit 1: What is science**

**Science…**

* **Science** is an organized way of gathering and analyzing evidence about the natural world.
* 1. Science deals with only the natural world.
* 2. Scientists collect and organize information in an orderly way, looking for patterns and connections among events.
* 3. Scientists propose explanations that are based on evidence, not belief.
* 4. Scientist then test those explanations with more evidence.

**What are the goals?**

* To provide natural explanations for events in the natural world.
* Science also aims to use those explanations to understand patterns in nature and to make useful predictions.

**Do we know everything about everything?**

* Scientific knowledge helps us cure diseases, place satellites in orbit, and send instantaneous electronic communications (yes….that means your text messages).
* Despite all we know, much of nature remains a mystery.
* Science never stands still, almost every major scientific discovery raises more questions than it answers.
* Science rarely “proves” anything, but aims to understand the natural world.

**Scientific Method**

* Observing and Asking Questions
* Inferring and Forming a hypothesis
* Designing Controlled experiments
* Control and Experimental Groups
* Collecting and Analyzing Data
* Drawing Conclusions

**Observation**

* **Observation** is the act of noticing and describing events or processes in a careful and orderly way.
* What do you notice about the two locations?

**Inferring and Forming a hypothesis**

* An **inference** is a logical interpretation based on what scientists already know.
* Inference, combined with a creative imagination, can lead to a hypothesis.
* A **hypothesis** is a scientific explanation for a set of observations that can be tested in ways that support or reject it.

**Designing Controlled experiments**

* Testing a scientific hypothesis often involves designing an experiment that keeps track of various factors that can change, or **variables**.
* When testing a hypothesis only one variable should be changed at a time.
* **Controlled experiment:**  an experiment where only one variable is changed.
* If several variables are changed in the experiment, researchers can’t easily tell which variable is responsible for the results they observe.

**Types of variables**

* **Independent variable**: the variable that is deliberately changed.
* **Dependent variable:** the variable that is observed and that changes in response to the independent variable.
* If I want to test the effects of herbicide on plant growth, what would be the
  + *Independent variable?*
  + *Dependent variable?*

**Control and Experimental Groups**

* **Control group** is exposed to the same conditions as the experimental group except for one independent variable.

**Collecting and Analyzing Data**

* **Qualitative data:** describes data that cannot be easily given a number.
  + *It grew mold.*
  + *The leaves turned yellow.*
  + *The participant complained of pain.*
* **Quantitative data:** are numbers obtained by measuring/counting
  + *The plant stem grew 5cm.*
  + *5 discs rose in the solution.*

**Drawing Conclusions**

* Scientists use experimental data as evidence to support, refute or revise the hypothesis being tested, and to draw a valid conclusion.
* Hypothesis are not always fully supported.
* Hypothesis may be reevaluated and revised; new predications are made, and new experiments are made.

**Hypothesis vs Law vs Theory**

* **Hypothesis:** testable explanation to a question
* **Law:** Describes what nature does under certain conditions.
* **Theory:** supported by large body of scientific evidence.